THE IRON TRADE REVIEW

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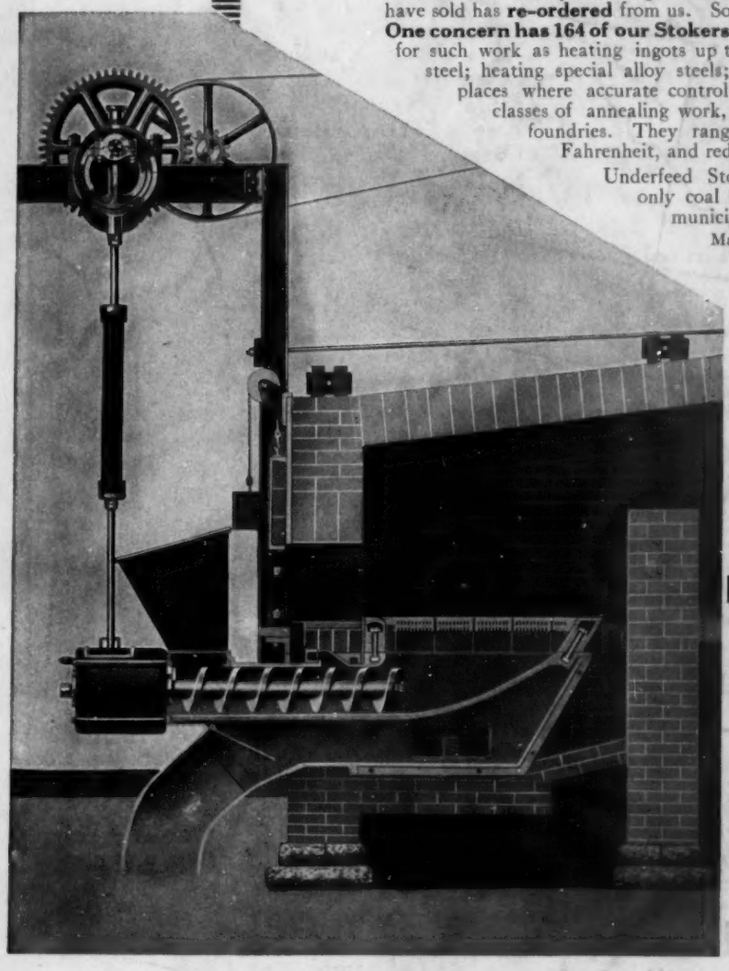

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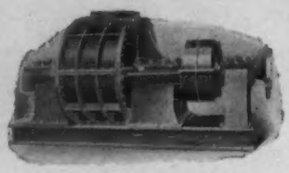

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THE IRON TRADE REVIEW

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Clamor for Contracts Unceasing

Advances in Prices Does Not Check Demand for Finished Materials—
Some Buying of Pig Iron for 1917 Delivery

MAKERS of all kinds of finished materials, especially plates and bars, are being besieged by consumers whose anxiety in regard to covering for their requirements is constantly increasing. Advances in prices seem to have no effect in checking the demand. Although strictly war business is not as much in evidence as it was a month or so ago, it is still a very important factor, and an eastern company engaged in the manufacture of munitions has just closed a contract with the British and Russian governments for making a large number of shells and is negotiating for 20,000 tons of steel to cover this order.

Pig Iron

In spite of the great strength of the pig iron market, it has developed that one seller at Buffalo has disposed of a considerable tonnage of foundry and malleable at $18, furnace, but other furnace interests in that district have declined to make concessions and are adhering rigidly to a minimum of $18.75. Sales at Chicago and Cleveland are heavy and one agency in the latter city has sold 60,000 tons of various grades during the past week. Sales of basic include 15,000 tons to the Standard Steel Works, Burnham, Pa., at about $18.25, valley; 5,000 tons to the West Leechburg Steel Co., and 10,000 tons to the West Penn Steel Co. An interesting development in the east is the willingness of some buyers to place orders for delivery in 1917 and one order for from 4,000 to 5,000 tons of basic has been entered by a large eastern Pennsylvania maker at $21, delivered, an advance of 75 cents over recent sales.

Shapes

Some mills have advanced prices of structural shapes $5 per ton this week and are now quoting 2.50c, Pittsburgh. Fabricating prices have advanced rapidly and in many cases the price of fabricated steel has been advanced from $36 to $40, named nine months ago, to from $70 to $75 on ordinary contracts, while some manufacturers on rush orders are paying as high as $175 for the steel erected. An example of a long delayed project, which has assumed definite shape, is that of the new Forest City House, Cleveland, which will require 4,500 tons. The city of Philadelphia expects to vote May 16 on the issuing of bonds for a very extensive building program.

Bars and Plates

Bars and plates are the two strongest products on the market. The agricultural implement makers, who are usually successful in obtaining concessions, are now contracting up to Jan. 1 at 2.25c, Pittsburgh, although some in the Chicago district recently covered at 1.90c. On plates, very high premiums are being paid for prompt delivery.

Ferro Alloys

The situation in ferro-manganese and spiegeleisen has become much more serious. Ferro-manganese, which was quoted at $38 at the time the European war was declared, has been sold at $350 within a few days for prompt delivery. English makers have advanced their last half contract prices to $175, and the tonnage for sale is extremely limited. Spiegeleisen for delivery during the last half is still quoted at $50, furnace, but an advance is expected.

Labor Conditions

Owing to the unusual demand for labor of all kinds, the very small immigration and the continued departure of foreigners to their native lands, labor conditions continue to cause much apprehension, but the agreement in the bituminous coal regions of four states and satisfactory adjustments in many industries encourage the belief that there will be no serious labor disturbances.

Pig Iron Production

The short month of February made a wonderful record in pig iron production, its daily average being 106,157 tons, the largest daily average in the history of the trade. The production for February was 3,078,548 tons, compared with 3,178,878 tons in the 31 days of January.

THE OPEN HEARTH

Its Greatness Not Sectional

IT IS of more than passing coincidence that the two largest steel works combinations which have grown out of the present unusual trade conditions, are made up largely of plants located in the eastern zone of the industry. With the possible exception of the Cambria Steel Co., whose works are at about the dividing line, commonly regarded, between the eastern and middle western manufacturing districts, all the units embraced in the Midvale Steel & Ordnance Co. and in the Bethlehem-Pennsylvania Steel consolidation are typically eastern enterprises.

This fact is of considerable interest, in view of the impression that has gone afield during the past decade that iron and steel production in eastern Pennsylvania and surrounding territory was in a decadent state, due to the cheaper raw materials that had favored the upbuilding of the great middle western industry because of the closer position to the Lake Superior ore deposits and to the coke fields. Some circumstances and events in recent years have seemed to support the belief that the light of old time glory of the eastern Pennsylvania and surrounding industry was fading and that under the western trend of the upgrowth of the country, the early prosperity of the eastern district was not likely to be restored.

A new factor now is operating to offset the western tide of development of the steel industry and to turn the minds of producers again to the desirability and advantages of locations along or nearby the Atlantic seaboard. This new element in the situation pertains to the more vigorous position which the American steel industry and American manufacturing as a whole are taking in foreign trade. The opinion of some of the keenest business minds of the country is that this movement will continue to progress with the passing of time and that what temporary advantages the nation has acquired in this trade through the effects of the present war will be permanently held in large part by American determination, inventive and commercial ingenuity. Directly associated with this new spirit of trade conquest beyond the seas now animating American manufacturers, are the rejuvenation and upbuilding of a merchant marine, with its great stimulus to ocean ship building, now in full swing. The extraordinary expansion of ship yard activity which the country, to its great gratification, has witnessed during the past year, is of broader advantage to the iron and steel industry of the east than that of any other section. Continuing development and explorations in Cuba and Chile and other countries within transportation limits of the Atlantic seaboard are improving the iron ore position of the eastern industry. Cheaper water transportation, by the construction of the New York state inland waterways, will advance this betterment both as to Adirondack and Lake Superior ores.

Mr. Schwab long since has expressed his belief in the eventual revival of the eastern iron and steel industry. His accomplishments at South Bethlehem are an impressive demonstration of how he has been able to make his convictions bear tangible fruit. What the Bethlehem Steel Co., as a shining manifestation of eastern steel enterprises, now is doing in providing for future operations on an extended scale, is being paralleled by the enlargements of capacity at numerous other plants.

To all present appearances, the eastern iron and steel industry has entered upon a process of revivification and rehabilitation which holds future possibilities of great importance. This is well, not only for the people of the east most directly concerned, but for the whole country, for it is best not to have a great business confined to one part of the country. As the mighty iron industry expands, its glory is spreading and its beneficent influence is felt increasingly north, east, south and west. No section prospers to the exclusion of any other section.

One Year's Good Record

THE recent appearance of Vice Chairman Hurley, of the federal trade commission, at the annual meeting of the American Pig Iron Association, in Cleveland, marked the taking of another step toward bringing associations of business men into closer and more harmonious relations with the government. The commission was organized on March 4, 1915, and at that time there was much uncertainty as to what policy would be pursued, but its course so far has been one of wisdom, avoiding, on the one hand, drastic proceedings against business and, on the other, not going farther than it had a right to go in assuring companies that their operations would not be interfered with. The commission has been described as a business doctor, called into being to treat industrial ills, its specialty being described as unfair competition which the act declares to be unlawful. The task of considering and classifying the many business practices alleged to be unfair has been most difficult and has not, of course, been entirely completed. Opportunities for making dangerous blunders resulting in harmful influence over the entire industrial world have been many, but chances for aiding business enterprises in many directions have been and will continue to be numerous. Observation of what the new body has done and plans to do has converted many doubters to the belief that the commission fully appreciates its

THE OPEN HEARTH

responsibilities and so far has measured up to them in a gratifying manner.

It has, from time to time, made it plain that it proposes to help business and the numerous addresses made by members of the commission, like that of Mr. Hurley recently delivered in Cleveland, have had much influence in the right direction.

The commission, perceiving that it had a practical labor before it, took up its duties with that object in mind, and has exercised them in a common sense way, so as to point out the line of demarcation between what is fair and what is not fair. Under the provisions of the Clayton anti-trust act, the commission is given authority specifically to prevent, under certain limitations, price discriminations, tying contracts, corporate purchase of stock, and interlocking directorates. The commission can, when it determines it is in the interest of the public, issue and serve upon a person, partnership, or corporation, a complaint stating the charges and containing notice naming the place and fixing a date for hearing within 30 days after service. The object of the commission's complaint will then have the right to appear and "show cause why an order should not be entered by the commission requiring such person, partnership or corporation, to cease and desist from the violation of the law so charged in said complaint."

The rules provide that, upon conviction, notice of the commission's action shall be formally served upon the party thus held to be guilty of using unfair methods. If its order is not obeyed, the commission will apply to the United States court of appeals for its enforcement. Notice of the commission's action will be served by the court, which shall take jurisdiction, and has power to enter a decree affirming, modifying or setting aside the order of the commission. The party required by an order of the commission to desist from specified unfair practices may apply to the circuit court of appeals for a review of the order. Upon certiorari, appeal to the United States Supreme Court is permitted.

Up to the present time, the commission has not found it necessary to exercise any powers of punishment vested in it, but it has freely endeavored to check abuses and to help in a friendly way in bringing about better competitive conditions. The commission uses the expression "conference rulings", rather than decisions, in announcing its conclusions and 40 of these rulings were recently made, indicating that those who were charged with illegal practices had co-operated in a cordial spirit with the commission and that the latter had shown no disposition to be anything but reasonable and helpful. Among the complaints filed with the commission are those against such practices as false and misleading advertising, bribery of employes committed by a corporation to get information from employes of a rival concern as to business secrets; espionage, indulged in by a company having men employed by a rival concern in an effort to forestall business plans of the latter; unjust price discrimination, intimidation of customers and misbranding of goods. All honest business men deplore such methods and with their help the commission can bring about decided changes for the better.

Labor Unions and Profit Sharing

OWING to the widespread interest in the efforts of employers of labor to establish plans for sharing with employes some of the earnings of manufacturing in addition to fixed regular wages, the National Civic Federation has made an extensive investigation and analysis of more than 200 profit-sharing plans in the United States. Many of the experiments have been abandoned as acknowledged failures; others are still in existence, with varying degrees of success, and differ widely in their methods. The views of many labor leaders were obtained and are unanimous in opposition to the general theory of profit sharing, as they claim that the employers' real interest in such plans lies in their alleged usefulness as a means to weaken and disrupt the trade unions. In other words, the trade union has been and is resolutely for the payment of wages according to a certain fixed rule of so much per hour or day per man, no matter whether this work is better than that of another man or not.

About one-third of the companies whose plans have been analyzed by the Federation report that they consider profit sharing a success. Others presumably hold the same view, as they continue the experiment from year to year. Among reasons given by employers for their faith in the idea are that it promises more continuous service, reduces cost of production, secures more regular attendance at work, builds up confidence and creates a spirit of co-operation, gets rid of rolling stones and encourages home building, promotes efficiency, interest and loyalty and increases the profits of the business. Surely with such results obtained by many companies, further investigation of profit sharing will be worth while and the publication of the full report of the Federation, which, it is announced, will be in book form, will be awaited with interest by many who are interested in this important subject.

Prices Present and Past

Quotations on leading products March 8, average for February, 1916, average for December, 1915, and average for March, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Mar. 8, 1916.	Aver. for Feb., 1916.	Average for Dec., 1915.	Aver. for Mar., 1915.
Bessemer pig iron, Pittsburgh	$21.45	$21.45	$19.85	$14.55
Basic pig iron, Pittsburgh	19.45	18.77	18.55	13.45
No. 2 Fdy. pig iron, Pittsburgh	19.45	19.51	18.85	13.80
Northern No. 2 Fdy., Chgo.	18.50	18.50	18.10	13.00
Lake Superior Charcoal, Chgo.	19.75	19.50	19.15	15.75
Mall. Bess., Chgo.	19.00	19.00	18.10	13.00
Southern No. 2, Birmingham	15.50	15.25	14.13	9.38
Southern Ohio No. 2, Ironton	18.00	18.00	17.00	12.75
Basic, eastern Pa.	20.00	19.50	18.00	14.00
No. 2X Virginia furnace	18.00	18.00	17.00	12.50
No. 2X foundry, Philadelphia	20.00	20.00	19.25	14.25
Ferro mang., Balti., (forward)	175.00	140.00	100.00	100.00
Bessemer billets, Pbgh.	40.00	34.00	29.60	19.50
Bess. sheet bars, Pbgh.	40.00	34.00	30.80	20.00
Op.-h'th sh. bars, Pbgh.	40.00	35.00	30.80	20.00
Open-hearth billets, Pbgh.	40.00	35.00	30.20	19.50
Steel bars, Chgo.	2.54	2.23	1.97	1.34
Steel bars, Pittsburgh, contr.	2.25	2.01	1.74	1.15
Iron bars, Philadelphia	2.559	2.409	1.959	1.15
Iron bars, Cleveland, local del'y.	2.40	2.29	1.75	1.15

	Prices Mar. 8, 1916.	Aver. for Feb., 1916.	Average for Dec., 1915.	Aver. for Mar., 1915.
Iron bars, Chgo. mill	$2.10	$1.91	$1.70	$1.10
Beams, Chgo.	2.54	2.22	1.97	1.34
Beams, Pittsburgh, contr.	2.25	2.03	1.74	1.15
Beams, Philadelphia	2.409	2.259	1.959	1.25
Tank plates, Pbgh., contract	2.25	2.13	1.74	1.125
Tank plates, Chicago	2.64	2.33	1.97	1.34
Tank plates, Philadelphia	3.159	2.709	1.959	1.25
Sheets, blk., No. 28, Pbgh.	2.75	2.60	2.54	1.80
Sheets, blue an., No. 10, Pbgh.	2.90	2.61	2.23	1.30
Sh., galv., No. 28, Pbgh.	5.00	4.75	4.25	3.40
Wire nails, Pittsburgh	2.40	2.22	2.02	1.60
Connellsville fur. coke, contr.	3.00	2.50	2.35	1.65
Connellsville fdy. coke, contr.	3.75	3.75	3.00	2.25
Heavy melting steel, Pbgh.	17.50	17.37	17.40	12.00
Heavy melting steel, east'n Pa.	16.50	16.50	16.00	11.00
Heavy melting steel, Chgo.	16.25	15.25	15.40	9.75
No. 1 wrought eastern Pa.	21.50	22.50	20.00	12.50
No. 1 wrought, Chgo.	16.25	14.93	15.15	9.00
Rerolling rails, Chgo.	17.25	17.12	16.70	10.00
Car wheels, Chgo.	14.00	14.06	14.75	10.00

(For Additional Prices See Page 568.)

One Buffalo Seller Shades Prices

Selling No. 2X and Malleable at $18—Other Buffalo Sellers Firm—Prices at Pittsburgh Show Upward Tendency—Heavy Buying at Cleveland

Buffalo, March 7.—The sales activity of one of the furnace interests of the Buffalo district has resulted in the booking of 85,000 to 90,000 tons of various grades, since the first of February. The largest order in the lot was for 10,000 tons and the remainder was in smaller tonnage lots, for delivery over the remainder of the year and one order calls for delivery up to July of 1917. Quoted market schedules for the various grades were shaded by one interest and some of the No. 2X foundry and malleable was booked at $18.00, f. o. b. furnace. Other sellers refused to cut and the concession prices have disappeared. The Buffalo furnaces generally now are holding firmly for $18.75 to $19 on No. 2X foundry and malleable for such deliveries as can be made up to July 1, and are asking 25 to 50 cents per ton higher for deliveries extending over the remainder of the year.

All of the furnace interests report that the inquiry for iron of the various grades has become more pronounced than has been noticed for a number of weeks. Melters throughout the territory served from this center are showing a greater interest in the matter of covering for their requirements for future needs. The number of melters coming into the market with their inquiries is on the increase. Some of the stacks of the district are sold up to a point where they are practically out of the market for a considerable portion of the year.

Heavy Selling

Cleveland, March 7.—Pig iron selling continues at a lively rate and during the first week of March one Cleveland agency has sold 60,000 tons, while other agencies report a very satisfactory business. In spite of the low selling by one interest at Buffalo, the market along the lakes continues firm.

Iron Sold Into 1917

Philadelphia, March 7.—Extended deliveries more and more are occupying the attention of pig iron consumers in this territory, but the sales still are not on a scale of tonnage to gain for themselves the term of a buying movement. An interesting angle of the situation is that some important consumers are willing to entertain propositions for 1917 delivery. It is understood, in fact, that one sale of standard basic for delivery in the first quarter of 1917 and calling for 4,000 to 5,000 tons has been closed by a large eastern Pennsylvania maker at about $21, delivered. This represents an approximately 75-cent advance over the last previous sale of eastern basic which, as reported in *The Iron Trade Review* last week, was to a Trenton melter for third and fourth quarters at $22.25, delivered.

It is noted that last half buying of low phosphorus iron is more active. Sales of standard iron for that shipment during the last week totaled about 8,000 tons at around $30, furnace, or over $32, Philadelphia basis. Lebanon makers disposed of several thousand tons at $32, furnace, and have a liberal inquiry, but are not inclined to quote freely for last half at this time. About 1,600 tons of standard low phosphorus, which originally had been purchased by an eastern Pennsylvania steel maker for first quarter, was resold to other users. The General Electric Co. took 1,000 tons of this metal. A Trenton buyer purchased 1,000 tons of Buffalo malleable for last half at a reported price of $18, furnace, or $20.54, delivered. Foundry iron prices range from $19.50 to $20, eastern Pennsylvania furnace, and sometimes the lower figure is shaded. An eastern Pennsylvania pipe foundry bought about 2,000 tons of off-iron at around $18.50, delivered. The United States Cast Iron Pipe & Foundry Co. was the recent purchaser of 2,500 tons of low grade Alabama metal. Holding back of shipments by railroad embar-

(*For complete prices see page* 568.)

goes is causing stocks on furnace banks in eastern Pennsylvania and Virginia to be enlarged somewhat. Makers in Virginia especially are being affected by this condition. One maker there who has been holding for $19.50, furnace, for No. 2X now is selling at $18 to $18.25 furnace. This range represents the actual Virginia market. The Keystone furnace of the Reading Iron Co. has been blown out.

Pig Iron Prices Tend Upward

Pittsburgh, March 7.—After an active buying movement, which began three weeks ago, prices of all grades of pig iron in the Pittsburgh district are higher. Steel making grades have advanced about 50 cents a ton and prices of foundry and malleable iron are much stronger than they were a fortnight ago. While buying this week has not been so active as it was the last week of February, yet in the aggregate, moderately heavy tonnages have been sold. The Standard Steel Works has closed for from 15,000 to 20,000 tons of basic iron for last half delivery to its plant at Burnham, Pa., paying from $18.25 to about $18.50, valley. The West Leechburg Steel Co. has closed for 5,000 tons of basic for second half delivery and the West Penn Steel Co has taken about 10,000 tons for similar shipment, paying current market prices. The Standard Sanitary Mfg. Co., which last week bought 5,000 tons of southern foundry iron, has since purchased about 10,000 tons of northern foundry iron for its plants in Allegheny and New Brighton, Pa. The company was unable to shade prevailing prices. Sales of foundry and malleable iron continue heavy and most dealers have advanced quotations to $19, valley, for second, third and fourth quarter delivery.

Recent Buffalo Drive

New York, March 7.—A spotty market, to which, no doubt, the continued railroad embargoes are lending their influence, prevails in pig iron in the metropolitan and adjoining districts. Their regular condition applies not only to the extent to which consumers are closing for forward delivery but also to the prices which makers are quoting. The principal price diversity is in the Buffalo and central Pennsylvania districts. It now is made clearer that considerable tonnage for last-half shipment is included in that recently booked by a certain producer in the Buffalo district at $18, furnace, or $20.54, New England, while this delivered figure has been shaded 25 cents by New York state makers who have some freight advantage in that direction. A considerable tonnage of malleable has been included in the recent Buffalo sales, among others, the partial purchase of the Eastern Malleable Iron Co. for last half. Large Massachusetts buyers of foundry iron also closed for considerable tonnage. Other Buffalo makers who are not aggressive to sell at present are holding No. 2X from $18.75 to $19.50, furnace. Tidewater prices show a wider spread of $19.75 to $20.50, for No. 2X. A northern New Jersey iron works bought 2,000 to 3,000 tons of eastern Pennsylvania standard forge for first-half at $19, furnace. A Long Island sound consumer inquired for 1,000 tons of low-grade iron but decided not to buy. The General Electric Co. asks 1,000 tons of forward malleable for Erie; a Connecticut consumer wants 600 tons of foundry and a Brooklyn shop, 600 tons of foundry.

Southern Iron Advances

Cincinnati, March 7.—Southern Ohio furnaces have advanced quotations on foundry, malleable and basic iron, to $19, Ironton basis, for 1916 delivery. A limited amount of resale iron is still obtainable at $18 to $18.50, and a few special sales have also been made by one furnace interest at $18.50 since the above advance took place. Southern No. 2 foundry is unchanged at from $15 to $15.50, Birmingham basis, for the first half, and from $15.50 to $16 for the second half. Prices are gradually growing stronger, and from all appearances the minimum figure of $15 will disappear in the near future. Silvery iron is given at from $26 to $27, furnace, for 8 per cent silicon, and producers state that the latter will be the minimum price by the end of the week. No new inquiries of importance have come before the market, but those pending and mentioned last week include 12,000 tons of basic iron from the Andrews Steel Co., Newport, Ky., and 15,000 tons from the Scullin Steel Co., St. Louis. Recent sales include 2,000 tons of charcoal iron and 4,000 tons of coke malleable in Michigan, and 1,000 tons of Virginia iron to an Indiana melter.

Northern Prices Stronger

Chicago, March 7.—Heavy buying of northern malleable and foundry pig iron has resulted in one producer advancing his price to $19.50, furnace, for foundry and malleable for any delivery this year. Other producers have not yet followed this advance, but undoubtedly will do so shortly.

Foundry iron may be bought at $18.50, furnace, and malleable at $19, furnace, for any delivery in 1916. It is believed the advance to $19.50 was brought about through a sale of a large tonnage to a malleable melter. Selling is steady in comparatively large tonnages and buyers apparently have concluded that present prices are as low as they can obtain for their requirements until the end of the year. An estimate of sales reveals that probably more than half the output of western furnaces for last half has been contracted and at the present rate of buying practically the entire output will be disposed of before long.

Southern iron is quoted by most makers at $15.50, Birmingham, for first half and $15.50 to $16, Birmingham, for last half. Some irregularity appears to exist in the southern market, various features appearing from time to time disturbing the stability of quotations. Recently one interest offered iron containing silicon higher than regular No. 2 analysis at $15, Birmingham, for last half and is said to have taken considerable tonnage. The price was withdrawn after a short time. Some observers believe this was warrant iron rather than the present output of a stack.

Charcoal iron continues active with quotations unchanged and considerable tonnages are being disposed of. The same wide range between prices of various producers continues.

Rally is Expected

Birmingham, Ala., March 7.—Indications rather strongly point to a rally of the pig iron situation in the Birmingham district, as viewed from the standpoint of the recent lull. With the passing of the unstable, or variant base price, has come confidence on the part of buyers that a common level has been reached, and that all interests are quoting a uniform price—the result has been that during the past week the different interests have booked between 40,000 and 50,000 tons of pig iron for delivery over the last half of the year. The bulk of the tonnage was placed at $15.50 per ton at the furnace, but some sales were made on basis of $16 per ton. The last named price, however, doubtless was obtained by reason of attractive elements. One interest alone sold between 20,000 and 25,000 tons; another 7,000 to 10,000 tons, and so on. While there is yet some tonnage being sold for shipment during the second quarter of the year, it is only small lots, being on the basis of $15 per ton at the furnace. Buyers generally seem to be comfortably taken care of for the first half of the year. One company reports that during the month of February and up to the present time, it has sold sufficient tonnage to warrant a withdrawal of solicitations, only taking care of its regular customers as they may come in.

(For complete prices see page 568.)

Ferro Commands $350 at Seaboard

Highest Figure Ever Recorded on Prompt Material—Almost a Famine in Spiegeleisen—California Rate Announced

New York, March 7.—Spot English ferro-manganese of 80 per cent standard quality has brought the highest prices in the memory of the present generation of buyers and sellers. Three carloads of this metal for immediate shipment were sold by middlemen in the Philadelphia district the past week at $350, seaboard, setting the highest figure that the present famine has brought forth. A carload of English for arrival in about 10 days was quoted in this city the past week at $300, seaboard. It is clear that prices for early delivery are practically anything that holders may ask, as some companies have been caught short by the delays of shipments from abroad and are paying dearly to be helped out of this predicament. There is very little spot to be had, however.

The contract market for last half, nominally, was advanced March 2 $25 a ton to $175, seaboard. This followed advances of from $125 to $150 on Feb. 11; $110 to $125 on Jan. 8, and $100 to $110 on Dec. 27. While all the English producers have adopted this figure and have so cabled their agents on this side, most of them state they have nothing to sell at present. The trade hears, however, that at least one maker has sold some tonnage at the new figure and certain consumers in eastern Pennsylvania report also having been quoted this price for the first half of 1917. Agents have submitted to their English principals offers by consumers of $175, seaboard, for last half delivery of this year which totals several thousand tons and action now is awaited upon these. Before the advance on contract ferro-manganese to $175, seaboard, one agent made some sales for last half at $160, seaboard, the official market at that time being $150, seaboard. Ground ferro-manganese has been sold freely at 13 cents per pound at the grinding plant and some sellers now quote 14 to 14½ cents.

Practically a famine condition exists in spot or nearby spiegeleisen, as the domestic supply has been bought up for some months ahead. Stocks with some consumers have fallen so low that certain of them have been threatened with shutdowns. An Ohio steel company has been in an embarrassed position in this regard and sellers are doing what they can to relieve it of its predicament by obtaining the consent of other buyers to divert to this consumer some of the tonnage about to be shipped to them on their contracts. Some tonnage has been gained for this user in this way. Further selling of domestic spiegeleisen for last half at $50, furnace, has been done. The Colorado producer has been offered $100, furnace, for a fair tonnage for April-July shipment. Present indications are that another advance in last half spiegeleisen will be announced in the near future.

Light Offerings

Philadelphia, March 7.—Offerings of foreign manganese ore are light and the prices which buyers are obliged to pay for cargo lots are not defined, as there have been no recent sales. No unsold Indian ore at all is in the market and merchants who have been seeking Brazilian ore have been unable to locate any free tonnage. One seller has been offering some Brazilian ore at Rio Janeiro, the buyer to provide the transportation. At present rates, the delivered price on this lot would represent about 63 cents per unit, eastern ports.

Advance Stimulates Buying

Pittsburgh, March 7.—The $3 advance in price, announced last week by manufacturers of lower grades of ferro-silicon, stimulated buying to a considerable extent. Almost every consumer of importance has covered requirements for the second half of the year; further advances in price appear likely. The situation for 80-per cent ferro-manganese continues acute, and some plants may have to shut down for want of this alloy. Dealers are asking from $225 to $250 a ton at the seaboard. Twenty per cent spiegeleisen is firm at $50, furnace. The market for 50-per cent ferro-silicon and steelmaking metals is nominal.

Announce California Rate

Chicago, March 7.—Consumers of ferro-manganese in this district have received notice of the freight rate on manganese ore from California points to Pittsburgh. The new tariff calls for a charge of 55 cents per 100 pounds on minimum shipments of 80,000 pounds from all California points to cities as far east as Pittsburgh. Shipments are expected to be made by the Pacific Coast Manganese Co., preliminary announcements stating that several thousand tons will be shipped monthly. The Miami Products Co., which has leased "A" stack of the Iroquois Iron Co., expects to produce ferro-manganese from California ore.

Consumers here are greatly interested today in an offer made by an English firm to sell any part of 5,000 tons of ferro-manganese for last half at $165, seaboard. The product offered was 70-per cent grade. No foreign maker previously has offered a product leaner than the standard 80-per cent grade. Some fear was expressed that this maker was unable to secure sufficient high grade ore. The price quoted compares with the ruling contract price of $175 for 80-per cent ferro-manganese.

(*For complete prices see page* 568.)

Wire Products Active

Pittsburgh, March 7. — Demand for wire products continues decidedly heavy, despite the fact that prevailing prices are the highest quoted in many years. Consumers are specifying briskly and express willingness to pay premiums for prompt delivery. Although shipments to the east and to European countries have been cut off, demands of central western and western consumers have more than absorbed the additional tonnage offered for distribution in those sections of the country. Wire nails are firmly held at $2.40 a keg. Most manufacturers are refusing to sell for delivery more than 60 days hence, and unspecified contracts are being cancelled in all instances. Tonnages have been allotted to weekly and monthly periods and when consumers fail to furnish specifications and shipping instructions, allotments automatically are cancelled.

Nuts, Bolts and Rivets

Pittsburgh, March 7. — Manufacturers predict that nuts, bolts and rivets will be advanced about $2 a ton at an early date. Scarcely any material has been sold for shipment the second half of the year, although demand for future delivery is active. Ship builders are specifying briskly for rivets and are paying premium prices for rather prompt delivery.

Many Structural Awards

Are Being Made—Fabricating Prices Show Sharp Advance —Philadelphia's Tremendous Building Program

New York, March 7.—A sharp contracting movement of building work in the metropolis for spring delivery, which began about two weeks ago, now has resulted in a total of from 15,000 to 20,000 tons of steel requirements being placed with the fabricating shops and mills. This activity is continuing and during the past several days not less than 10,000 tons of new work was placed, much of which has not yet been publicly announced. Buyers still are adopting considerable secrecy in placing work and have been enjoining fabricators and mill representatives to say nothing for the present about their contracts, even though they have been closed finally. Included in the lettings of the past few days were two loft buildings requiring about 2,000 tons each, details of which are withheld. An industrial plant requiring 4,000 to 5,000 tons is being quietly figured. Most of the work closed is of the loft-building class, but Pennsylvania railroad interests now are asking bids on a hotel to require about 10,000 tons and another hotel project in this city, about 12,000 tons, has been brought to the attention of the shops. Some very high prices are being obtained for fabricated steel where prompt shipment is furnished. One lot to be delivered by early May was closed at $175 per ton, erected, including a bonus for quick work. Warehouse prices for steel were paid. Plain material prices are strong at a minimum of 2.25c, Pittsburgh, or 2.419c, New York.

Structural Shapes Firm

Pittsburgh, March 7.—Numerous fabricators in the Greater Pittsburgh district have been urging mills to hasten shipments, but considerable complaint is heard about delayed deliveries. Several fabricators have had to fall upon warehouses for material in order to complete contracts. Structural shapes for delivery at the convenience of the mill are offered at 2.25c, but some tonnage for forward delivery is commanding as high as 2.50c and premiums ranging from $3 to $7 a ton are being offered for nearby shipment.

Philadelphia Plans Big Tonnage

Philadelphia, March 7.—Prospects for a very heavy tonnage of structural steel, estimated by some makers at several hundred thousand tons, to cover a large program of new construction for the city of Philadelphia and benefiting railroads, have been placed in more definite form by the proposal for a municipal election May 16 to vote on the issuance of $87,000,000 of bonds for this work. Of this amount, $35,000,000 is to be devoted to rapid transit construction, $5,000,000 for port improvements and about $9,000,000 for grade crossings and a belt line. The belt line about the city will be built by the Pennsylvania and Baltimore & Ohio railroads in conjunction with the city. The Pennsylvania railroad also will be a party to the raising of tracks, and the Washington avenue line alone, it is estimated, may require 40,000 tons of steel. These improvements, if they are carried out in their present form, will require several years to complete. Structural steelmakers point to this program as examples of important public work in prospect in the east which they believe will have an important bearing on the structural market. Although February usually is considered the poorest month of the year in new construction, mill bookings in that period by practically all eastern Pennsylvania shape makers were record-breaking in tonnage. Specifications are very active and new orders are heavier. Incoming tonnage continues in excess of shipments and prices are strong at 2.25c, Pittsburgh, or 2.409c, Philadelphia, as minimum, and ranging to $5 to $6 higher. Some mills cannot ship any sizeable tonnage before June. The Lenoir City, Tenn., car shop, which recently asked 4,000 tons of shapes, has revived this matter in reduced form, or for about 3,000 tons for shipment as makers are able.

Fabricated Steel Higher

Cleveland, March 7.—The structural market in the Cleveland district is showing more life than for a long time. This is true in spite of the fact that prices, not only on the plain material, but for fabricating and erecting, have advanced sharply. Nine months ago, bids on fabricated steel ranged from $36 to $40 per ton and are now fully $30 per ton higher. It is understood that the rebuilding of the Boody House, Toledo, has been postponed for an indefinite time, but it apparently is the only new building in northern Ohio that has been delayed on account of the advance in prices. The erection of a new Forest City House on the site of the old building, which has long been talked of, has now assumed definite shape and it is expected that a contract for 4,500 tons of steel will be awarded this week. The Massillon Bridge & Structural Co., which has taken contracts for a number of buildings in lake cities within the past few weeks, is in the market for 2,000 tons of structural steel. The American Bridge Co. has taken a contract for 1,450 tons for an addition to the plant of the Firestone Tire & Rubber Co., Akron, O. The Owen Booth Bottle Machinery Co., Toledo, will build a plant at Charleston, W. Va., which will require 2,500 tons of steel.

Structural Tonnages Small

Chicago, March 7.—Structural projects in the west continue to come forth in small tonnages for the most part, although one letting at Milwaukee last week involves 2,000 tons for the Milwaukee Athletic club building, which will be furnished by the Worden-Allen Co. Other work is largely bridges with some industrial work also.

Present price, 2.44c, Chicago mill, for structural shapes apparently is something of a damper on some projects which are not being pressed forward on account of additional cost.

CONTRACTS AWARDED.

Milwaukee Atheltic club, Milwaukee, Wis., 2,000 tons, to Worden-Allen Co.

Great Northern railroad, girder spans, 743 tons.

Ventura County, Cal., highway spans, Saticoy bridge and Sespe bridge, 351 tons—Saticoy bridge awarded to Clinton Bridge Co., 220 tons. Sespe bridge awarded to Missouri Valley Bridge & Iron Co., 131 tons.

Oregon Utah Sugar Refining Co., sugar factory, Grants Pass, Oregon, 300 tons, to Minneapolis Steel & Machinery Co.

Arkansas Valley Light & Power Co., power house, Cannon City, Cal., 245 tons, to Minneapolis Steel & Machinery Co.

Mineral Range railroad, bridges, near Hancock, Mich., 227 tons to American Bridge Co.

Transfer bridge for the Long Island railroad in Bay Ridge, Brooklyn, 1,400 tons, to the American Bridge Co.

Sub-stations for the Interborough Rapid Transit Co., 800 tons, to L. F. Shoemaker & Co.

Bridge for the Erie railroad at Rochester, 900 tons, equally divided between the Pennsylvania Steel Co. and the Fort Pitt Bridge Works.

Bridge for the Philadelphia & Reading railroad at Walnut street, Philadelphia, 130 tons, to the Pennsylvania Steel Co.

Loft building for Pinchot estate, Sixty-fourth street, 1,900 tons; loft for Wallace Estate, Fifty-fourth street and Eleventh avenue, 1,100 tons; Hasco loft, East Thirty-second street, 900 tons; loft for Girard estate, West Fortieth street, 800 tons, all in New York

(*For complete prices see page* 568.)

City, and 250 tons for a theater for Levy Bros., Myrtle avenue and Madison street, Brooklyn, all to the Harris-Silvers-Baker Co.

Waite apartment, West Sixty-ninth street, 475 tons, New York City, to the Hedden Iron Construction Co.

Two loft buildings for unknown parties in New York City, about 2,000 tons each to independent shops.

Building for the Victor Talking Machine Co., Camden, N. J., 400 to 500 tons, general contract to Irwin & Leighton.

Addition to plant of the Carpenter Steel Co., Reading, Pa., 400 tons to the Eastern Steel Co.

Cement plant, German - American Portland Cement Works, LaSalle, Ill., 1,025 tons, to the Massillon Bridge & Structural Co.

Office building to be erected at Erie, Pa., by J. B. Campbell, 320 tons, to the Massillon Bridge & Structural Co.

Addition to the plant of the Firestone Tire & Rubber Co., Akron, O., 1,450 tons, to the American Bridge Co.

Storage warehouse for the Merchants Refrigerating Co., Eleventh avenue, New York City, 5,000 tons to an independent shop.

Addition to bank building, Middletown, N. Y., 250 tons, to American Bridge Co.

CONTRACTS PENDING.

Bridge for the Baltimore & Ohio railroad, 600 tons, bids being taken.

Iron ore pier for Witherbee, Sherman & Co., Inc., Port Henry, N. Y., 500 to 600 tons, bids being taken.

Coliseum at Eighth avenue and Forty-ninth street, New York City, 1,100 tons, bids being taken.

Warehouse, Broome street, New York City, 1,000 tons, bids being taken.

Hotel in Pennsylvania railroad terminal zone, New York City, for Pennsylvania railroad interests, about 10,000 tons, bids being taken.

Service station for Willys-Overland Co., New York City, 1,000 tons, bids being taken.

New Forest City House, Cleveland, 4,500 tons.

Plant at Charleston, W. Va., for the Owen Booth Bottle Machinery Co., Toledo, O., 2,500 tons.

Plate Makers Are Besieged

By Car and Ship Builders Who Are Very Anxious to Contract and Are Willing to Pay Almost Any Price

Pittsburgh, March 7.—Car and ship builders literally are besieging plate manufacturers for additional material for shipment before July 1, but such inquiries are going begging in the Pittsburgh market. Plate mills, with few exceptions, have sold their output for the remainder of the year; except in a few instances, no material has been sold for delivery in 1917. Specifications against contracts show no diminution and inquiries have not fallen off, despite prevailing high prices. Steel plates for nearby shipment are commanding 3c and above.

Practically No Plate Limit

Philadelphia, March 7.—Plates remain the strongest finished product in the eastern market and buyers appear willing to pay most any price to protect themselves. Good-sized tonnages for future delivery were sold by one eastern Pennsylvania maker this week at 3.50c, mill. Further sales of single carloads for prompt shipment were made at 5.00c, mill. Practically all the leading eastern makers now ask 3.25c, Pittsburgh, and deliveries are varied. One can ship tank steel in eight to 10 weeks; another, universal plates in two to three months, but other grades not under six months. Some large tonnages continue in the market which it is difficult to place. The Pennsylvania Ship Building Co., which will build a new shipyard on the Delaware river at Gloucester, N. J., continues to figure on 10,400 tons of plates for delivery over 18 months, or 600 tons monthly, beginning next August. This inquiry was reported in *The Iron Trade Review* last week and is to cover six vessels which it is understood are for Norwegian owners. The Lenoir City, Tenn., car works, which recently was unable to place 6,000 to 8,000 tons of plates for early shipment, now is out to buy about 5,000 tons and will accept the best delivery obtainable.

Firm at Cleveland

Cleveland, March 7.—The plate market is exceedingly strong and Cleveland mills have no difficulty in getting 3.25c for reasonably prompt delivery and in some cases in which protection was given against definite jobs, 2.60c was the price named for delivery in the fourth quarter. Contracts have been signed for the two Norwegian boats recently ordered from the Manitowoc Ship Building & Dry Dock Co. The American Ship Building Co. has closed a contract with the Standard Oil Co. for a barge to be built full Welland canal size.

One maker in the Pittsburgh district has taken an order for 1,000 tons of plates for third quarter delivery at 3c.

Plates Are Scarcest

Chicago, March 7.—The situation as to steel plates is the tightest of all finished steel products. So difficult is it to obtain plates that one steel mill making extensions has had difficulty in placing an order for large and heavy plates for blast furnace construction. Prevailing quotations for delivery at the convenience of the mill is 2.54c, Chicago mill, but prompt plates, when they can be obtained at all, are being sold for premiums bringing the price well above 3c, Chicago.

(*For complete prices see page* 568.)

Iron Ore Needed

Plan to Break Ice For Early Shipment

Cleveland, March 7.—Indications are that the opening of navigation this year will be very early—possibly the earliest in the history of the lakes. The Pittsburgh Steamship Co. is consulting ore shippers and vessel owners as to the advisability of attempting to open a channel at Escanaba as soon as possible after March 20. The vessel men do not seem to be disposed to co-operate as far as Escanaba is concerned, unless an effort is made to break through the Straits of Mackinac. The Steel Corporation is anxious to have shipments to South Chicago and Gary begin as soon as possible. It is understood that one of the independent steel companies in the Chicago district fears that it will not be able to keep its furnaces going unless there is a very early opening of navigation.

The movement of iron ore from lower lake docks to furnaces was very heavy during February. The tonnage remaining on dock March 1 was 6,213,739, a reduction of 860,266 tons during the month. This was a new record for shipments, the February movement for the past three years being as follows: 1912, 439,254; 1913, 586,235; 1914, 424,649. It is expected that the March movement will also be very heavy. The outlook is that the tonnage on docks at the opening of navigation will be smaller than for many years.

Warehouse Prices Firm

Cincinnati, March 7. — Warehouse prices are holding firm following the advance of last week, and the tendency today is to go higher. Cold rolled round bars are now given at 5 per cent off list price, in comparison with 10 per cent off last week, and flat, square, and hexagon bars today are quoted at list price. Shapes and plates are given at from 3c to 3.15c. Warehouse sheet prices are as follows: No. 28 black 3.65c, No. 28 galvanized 5.30c, and No. 10 blue annealed 3.25c to 3.50c.

Sheet Market is Stronger

Important Consumers Endeavoring to Contract for the Year—Light Gages in Better Demand

Youngstown, March 7.—The sheet market has strengthened during the past few days. The action of the leading Pittsburgh interest in advancing quotations last week had a stiffening influence on valley makers. A number of other causes, however, contribute to the increased strength now displayed by the market. Some large interests which ordinarily cover their requirements for six months at a time are now entering the market with inquiries for sufficient tonnage to carry them through the remainder of the year. Many consumers, among them these large interests, believe that sheet prices will advance higher, and their efforts to secure sufficient tonnage to satisfy their requirements up to Jan. 1, 1917, are based on this belief. Another strengthening factor is the heavy buying by automobile and electrical interests. Automobile makers, particularly, are in the market for large tonnages, mostly of Nos. 16 and 22 gages. This business is being quoted largely on a 3c base, the delivered cost at Detroit being close to 4c. Some mills also are asking higher prices, due to the rise in the cost of steel. The bulk of the sheet business for some months past has been carried along on comparatively low-priced steel, some makers having $25 steel in stock yet. Compared with today's market of $40 to $42 for semi-finished steel, sheet mills which can operate profitably at today's prices for finished sheets would barely break even if they were to cover their future steel requirements at the advanced prices. Some tonnage also has developed during the past few days from consumers who have held off buying, apparently in the belief that sheet prices would decline. Light sheets are in better demand, and are being held at 2.75c to 2.85c. Some mills are quoting higher figures, one consumer receiving a quotation of 3.10c on an inquiry for 10,000 tons. Blue annealed sheets, which are held at Pittsburgh at 2.90c to 3c, still continue in good demand. Though prices on this grade have risen during the past few days, desirable business could still be taken at 2.75c. The weakness in spelter during the past few days has affected the galvanized sheet market. Both mills and consumers are apparently willing to wait until the spelter market assumes a definite course.

The car shortage continues to hamper mill operations. The practice of shipping sheets in gondolas is followed generally. The railroads apparently are unable to furnish equipment regularly, the mills getting their full requirements one day and only 30 to 40 per cent the next. Much finished product is going into warehouse until equipment for moving it can be secured. Some of these stocked sheets were already loaded when additional embargoes were announced, and it was necessary to unload the car and reload it with products destined for other points. Many mills are protecting themselves against loss on export shipments by providing that the consumer make payment when the goods are finished, thus relieving the mill of any danger of loss through demurrage costs or charges for carrying the goods in its warehouse. The anxiety of consumers to secure deliveries, particularly into eastern territory, has caused a wider adoption of the practice of sending tracers with each shipment. These men invaded the valley in force last week. They follow the loaded car from point to point in an effort to expedite delivery at the consumer's plant.

Sheet Market Irregular

Chicago, March 7.—Exact quotations on steel sheets are difficult, as makers are quoting a wide range of prices. While 2.94c to 3.19c, Chicago mill, represent the spread on No. No. 28 gage black and No. 10 gage blue annealed, occasional tonnages are being sold at slightly less than the minimum for certain sizes. Contracts for delivery at the convenience of the mill run at about 2.94c, Chicago, while prompt or 30-day delivery usually is taken at 3.19c, Chicago.

Sheet Prices Higher

Pittsburgh, March 7.—Advanced prices of steel sheets, announced last week by the American Sheet & Tin Plate Co., have been adopted by all independent makers in western Pennsylvania. The market is decidedly strong and further advances are predicted. Mills rolling lighter gages have advanced quotations and the general situation is much more satisfactory than it was a few weeks ago. In a number of instances, consumers have been able to cover second half requirements, and many of them have offered to pay premium prices for shipment in 1917. Automobile builders and manufacturers of electrical equipment have been figuring prominently in the market the last 10 days. Most mills have allotted their output for distribution the third and fourth quarters of the year. No. 28 gage black sheets are quoted at from 2.75c to 2.85c; No. 10 gage blue annealed, from 2.90c to 3c, and No. 28 gage galvanized sheets, from 4.75c to 5.25c. It frequently is predicted that galvanized sheets will be held at 5c and above by the end of the week.

(*For complete prices see page* 568.)

More Contracts at 3.25c

Philadelphia, March 6.—Where buyers by their insistence have forced the makers to act, further contracts for blue annealed sheets for third quarter have been closed by eastern Pennsylvania mills at 3.25c, Pittsburgh, or 3.409c, Philadelphia, for No. 10 gage. This is the minimum figure eastern makers now will entertain for this delivery, but as they have sold up their capacity into August, they are following conservative policies in booking additional tonnage. The Pennsylvania railroad has placed a good tonnage of heavy sheets for box car construction at Altoona, the business going to a leading eastern Pennsylvania maker.

Tin Plate Active

Pittsburgh, March 7.—Demand for tin plate continues tremendous and if it were not for congested traffic conditions in the east, heavy tonnages would be sold for export. Some mills are asking $4.25 base, but the bulk of the tonnage for the year was sold shortly after books for the 1916 season were opened at $3.60 per 100-pound box of 14 x 20 prime bessemer coke, last November.

Cold Rolled Strip Steel

Pittsburgh, March 7.—Cold rolled strip steel now is selling at a range from 5c to 5.50c for delivery before July 1. Makers have not opened books for second half shipment, despite contrary reports. Some mills are quoting as high as 6c, and it is predicted that that figure will represent the market before the end of the first quarter of the year. Inquiries for export involve heavy tonnages, but manufacturers are refusing to consider them, apparently preferring to take care of their domestic trade.

The plant of Hubbard & Co., Pittsburgh, was damaged by fire recently. The loss is estimated at $100,000.

Bars for This Year Only

Agricultural Implement Manufacturers Pay 2.25c—Tremendous Tonnages of Shell Steel Pending

Pittsburgh, March 7.—Despite efforts of some of the heaviest consumers, manufacturers of steel bars have refused to sell for delivery after Dec. 31. Agricultural implement makers, who figured prominently in the market a fortnight ago, were unable to buy for delivery over a 12-months' period, a privilege which they generally enjoyed in past years. This year, they were forced to pay the prevailing market price for all the tonnage they purchased. Pending inquiries for material for the manufacture of shells involve tremendous tonnages; some prospective shell-makers are attempting to buy for delivery the early part of 1917. Steel bars are being held at 2.25c and above for delivery at the convenience of the mill; premium prices are being paid for nearby shipment. Iron bars are commanding from 2.40c to 2.50c, Pittsburgh.

High Prices Prevail

Cleveland, March 7.—The bar market is very strong. One positive evidence of this is the fact that agricultural implement manufacturers are making contracts at 2.25c, although some of the implement concerns in the Chicago district recently contracted at 1.90c. The usual quotation on bars is from 2.35c to 2.40c and delivery prior to the fourth quarter is not promised. On hard steel bars, 2.35c is the price and the mills are very slow to take on tonnages of any size. One leading mill within a few days refused to take an order for 1,000 tons.

Some Bar Contracting Reported

Philadelphia, March 6.—Buyers of steel bars in this district, as a rule, still are unable to get the mills to accept their offers to make future contracts after July. The Norfolk & Western railroad, however, is understood to have placed 1,000 tons for third quarter at 1.90c, Pittsburgh. This quotation probably had been outstanding for some days, as all makers now regard 2.25c, Pittsburgh, as the official contract price, even though some of them will not quote. Farming implement manufacturers in eastern Pennsylvania continue among those who are desirous of making contracts. Steels bars for earlier shipment than last half are going at premiums over the official price. In ammunition stock, 600 tons of shrapnel rounds for shipment before July was placed at 3.70c, mill. Certain eastern Pennsylvania makers had a chance at the business, but did not accept, as they are out of the market on shell steel. The rehabilitated plant of the Delaware Steel & Ordnance Co., at Wilmington, Del., will begin operations in a week or two. This company, as previously noted, is credited with large contracts for shell bars and blooms for European belligerents.

Steel Bars Hard to Find

Chicago, March 7.—Steel mills find consumers of other products insisting on further supply which they are unable to provide. The nominal quotation on steel bars is 2.44c, Chicago mill, but users are willing to pay considerable premiums for prompt tonnage wherever it can be obtained, which is not often. Prices range as high as 3c, Chicago.

Bar Iron Higher

Chicago, March 7.—Makers of iron bars have advanced prices sharply from a former basis of 2c to 2.10c to the present spread of 2.10c to 2.25c, Chicago mill. Some makers are taking tonnages at 2.10c to 2.15c for immediate delivery, although little is available for this purpose and second quarter contracts are at the maximum figure given above.

Most makers have their capacity well engaged for about 60 days and some have comparatively little open tonnage before the middle of the year.

Demand is coming more strongly, as iron bars are being substituted for steel bars in many places where the latter cannot be obtained.

Hoops, Bands and Shafting

Pittsburgh, March 7.—Manufacturers of cold rolled steel shafting in the Greater Pittsburgh district now are asking 30 per cent off the list for carload tonnages, or $5 a ton above the previously prevailing minimum price; from 20 to 25 per cent off the list is being asked for less than carload tonnages, and warehouses are quoting list price and above.

Hoops are firm at 2.50c and bands at 2.25c for future delivery. Specifications are heavy and pending inquiries involve considerable tonnage. Interest is manifested in the announcement that the Chattanooga Steel Co., recently organized, will install a cotton tie mill in its plant at Chattanooga, Tenn. Plans of the company are outlined elsewhere in this issue of *The Iron Trade Review*.

(*For complete prices see page* 568.)

Billets Are High

Locomotive Company Paid $85 for Forging Blooms

Philadelphia, March 6. — Billets and other semi-finished forms remain on a very high price plane in this territory because the supply is short. A leading eastern Pennsylvania maker has sold some thousands of tons of forging billets to regular customers for third quarter shipment at $65 mill. These sales were made the past week and are in addition to a few scattered transactions previously closed at the same figure. No sales of open hearth rolling billets for third quarter have been made by this producer, but a quotation of $50 mill has been adopted. It now is learned that a sale of 2,500 to 3,000 tons of forging blooms for comparatively early shipment made by a western Pennsylvania maker at $85, Pittsburgh base, as stated in this paper last week, was to the American Locomotive Co. These blooms will be rolled into locomotive axle billets. On a lot of 4,000 to 5,000 tons of open hearth sheet bars for first half, $45, Ohio mill, was quoted this week to a buyer in this district. Another Ohio maker is offering here about 2,000 tons of odds and ends of open hearth ingots and blooms, prices to be fixed as business is submitted.

Negotiate for Second Quarter

Pittsburgh, March 7. — Leading consumers of semi-finished steel products are opening negotiations for second quarter requirements and active buying for delivery during that period soon will feature the market. Sellers express the belief that sheet bars and billets for shipment during April, May and June will command current market prices, although buyers say they will be able to shade these prices by a slight margin. Numerous lots of open hearth sheet bars have been sold at $42, mill and billets are commanding as high as $40. Wire rods, demand for which is heavy, are being held at from $50 to $60 a ton. Canadian interests have entered the domestic market for heavy tonnages of rods and belligerent European nations are inquiring for large tonnages. Muck bar is quoted at $40, Pittsburgh.

Market Very Strong

Youngstown, March 7.—Despite the absence of sales, the semi-finished steel

market in the valleys continues strong. Makers are sold up to a degree that prohibits the movement of much spot business. The occasional tonnage offered is eagerly taken, as evidenced by the sale last week of several carloads of bessemer billets at $42. No contracts have been signed covering sheet bar requirements of the valley sheet mills for last half. The impression prevails generally that sheet mills will be offered steel at $40, although some observers predict an even higher figure. With makers able to furnish the mills only about 60 per cent of their specifications, many consumers expect to be forced into the open market, if plant operations are maintained at capacity.

Heavy Buying

By the Steel Corporation Brings Strength to Scrap Market

Pittsburgh, March 7.—Heavy buying on the part of the Carnegie Steel Co. the latter part of February tended to strengthen materially, the market for heavy melting steel, which now is being held at a range from $17.50 to $18, delivered. Other grades reflect moderate strength and dealers predict that minimum quotations soon will disappear. Demand for wrought scrap for eastern shipment is heavy. Railroads continue to offer rather heavy tonnages of miscellaneous grades. Most of the railroad material is being purchased by melters.

Heavy Shipments Check Buying

Philadelphia, March 6.—New buying of iron and steel scrap in eastern Pennsylvania is surprisingly thin in view of the tremendous scale of present consumption. The explanation of this seems to lie in the heavy shipments which recently have gone to users and which have led to the placing of embargoes at important consuming points by the railroads. This rush of deliveries now has become intensified in the cases of certain mill locations which up to this time have been free and the handling facilities of some of the buyers are overtaxed. One mill, a day or two ago, had 200 cars awaiting unloading; another, 60 cars. Prices in general are stable, as there is small inclination among traders and consumers to either buy or sell. Railroad wrought is lower. An eastern Pennsylvania steelmaker has sold a fair amount of low phosphorus plate shearings at $21.50, mill.

Drawing From East

New York, March 7.—An advanced market for heavy melting steel in Pittsburgh and other western districts is drawing material from eastern territory since the prices are more attractive than those offered by eastern Pennsylvania consumers. Embargoes which are blocking the shipment of scrap to various eastern points, also favor the western movement. For heavy steel for Pittsburgh, dealers are offering $15.25, New York, as it is understood from $18 to $18.25, delivered, is being paid. The best offers on steel from eastern Pennsylvania are $17, delivered, or about $14.50 to $14.75, New York. Sellers naturally are not interested in these prices. Except for western delivery, new business is light. There has been some falling off of prices, especially in wrought scrap, borings and turnings.

Buffalo Heavy Melting Rises

Buffalo, March 7.—The strong demand for heavy melting steel has caused the price to advance to $17 to $17.50. The demand at this time is reported greater than has appeared so far since the beginning of the year. The advance noted is 50 cents higher than was obtainable a week ago. All of the commodities in the scrap list are in good demand with the possible exception of old car wheels, railroad malleable and cast scrap. The slackening in activity in these lines, however, has caused no softening in the prices previously quoted. All of the dealers of the district are looking for a further stiffening in the prices.

Cleveland Market Takes Brace

Cleveland, March 7.—A pronounced feeling of strength is being evidenced in the Cleveland scrap market. This condition is traceable to a great degree to the heavy buying of the past ten days in the Pittsburgh territory. Interests in that district, it is reported, are still entertaining quotations and it is not known at this time to what extent they will purchase. This heavy shipment of scrap into Pittsburgh has necessarily taken much available material out of the market, and, since many yards have been considerably depleted in the past 60 days, a price advance is expected to take place. At the present time, there have been no changes, and heavy melting steel is still quoted at $16.25 to $16.75 gross tons, Cleveland.

Active at Cincinnati

Cincinnati, March 7. — Buying of heavy melting steel and mixed cast continues good, and is keeping the iron and steel scrap market in an active condition. The former is quoted at from $13.75 to $14.25 per gross ton, and the latter at from $10.25 to $10.75 per net ton. Rolling mills are taking good shipments on contracts, and jobbing foundries have been buying in better lots during the past two weeks than at any time since the first of the year. No. 1 machine cast is still slower than it should be, and is quoted at from $11.50 to $12 per net ton.

(*For complete prices see page* 568.)

Strong Buying Boosts Scrap

Chicago, March 7.—Comparatively large buying of heavy melting steel by leading users in this market has caused the market to rebound and has resulted in gains of more than had been lost in the recent decline. Quotations on all items have advanced whether they have been the subject of trading or are stronger simply in sympathy.

Some dealers are in doubt whether these levels will be maintained while others feel certain that much higher prices than at present will be current in a short time. Two blast furnace stacks at the Gary works of the Illinois Steel Co. are out for relining, making necessary larger use of scrap to supply open hearths. Considerable buying of No. 1 wrought has been done recently, giving a better tone to the market for this commodity.

Railroad offerings are more than was the case recently, the Union Pacific offering 2,000 tons, the Southern railway 3,500 tons, the Wabash railroad 1,900 tons, the Kansas City Southern 235 tons, the Chicago, Milwaukee & St. Paul railroad 2,140 tons, and the Mobile & Ohio 900 tons.

Making Headway.

St. Louis, March 7. — The iron and steel scrap market which has been drifting for some weeks is again making headway on account of renewed buying by consumers of steel and rolling mill grades. However, purchases by consumers have not been especially heavy to date, but the belief is that business will become very active by the middle of the month, and dealers are storing material wherever possible against the future.

The railroad offerings include: Kansas City Southern, 500 tons; Mobile & Ohio, 870 tons; Wabash railway, 2,500 tons. An open list from the New York Central also is out, very little of which tonnage will move into this market.

Firmer in South

Birmingham, Ala., March 7.—There is a decidedly firmer tone to the old material market. Sales during the week showed a material improvement over the previous week, and considerable strength is evinced for good machinery and steel scrap. Dealers report that they expect a reinstatement of recently lowered prices by the middle of the month, at least.

Conspiracy

To Fix Wages Charged in Indictment of Steel Companies and Judge Gary

Youngstown, March 8. (By wire.)—Indictments were returned today noon by the Mahoning County, Ohio grand jury against the Youngstown Sheet & Tube Co., the Republic Iron & Steel Co., the Brier Hill Steel Co. and the Carnegie Steel Co. and E. H. Gary, chairman of the United States Steel Corporation, the defendants being charged with having formed a trust to fix the wages of common labor. Among other things, the report flays Mayor W. H. Cunningham of East Youngstown, and his police force for inefficiency and disregard of the law, and as being unfit and unworthy to hold a public trust, judging from their actions during the strike trouble.

Death of Col. J. C. Hooven

Col. John Clinton Hooven, president of the Hooven, Owens & Rentschler Co., Hamilton, O., died suddenly March 1 while seated with his family at luncheon at his residence on South B street, that city. He had been in ill health for a long time. Colonel Hooven was born in Montgomery county, Ohio, in 1843.

Thomas B. Crawford, aged 29, the youngest of four sons of C. W. Crawford, president of the Crawford & McCrimmon Co., Brazil, Ind., builder of mine equipment machinery, all being actively engaged in the business, died Feb. 18 at the Methodist hospital in Indianapolis, after undergoing two operations. The deceased was the inventor of numerous methods for improving foundry practice and assisted in designing and laying out the new plant of the Crawford & McCrimmon Co.

James Asa Childs, brother-in-law of Henry C. Frick, and superintendent of the H. C. Frick Coke Co. at Connellsville, Pa., died March 1 at the Presbyterian hospital, New York City, aged 53 years. He was operated upon for appendicitis three weeks ago.

Heavy Exports

For the First Month of the Year and for the Seven-Month Period

The statistical report of the bureau of foreign and domestic commerce for January shows that exports of iron and steel products were almost exactly the same as for December, the total being 353,836 tons in December and 354,416 tons in January. For the seven months ending with January, the exports were 2,589,018 tons in 1916, compared with only 844,649 tons for the same period in 1915.

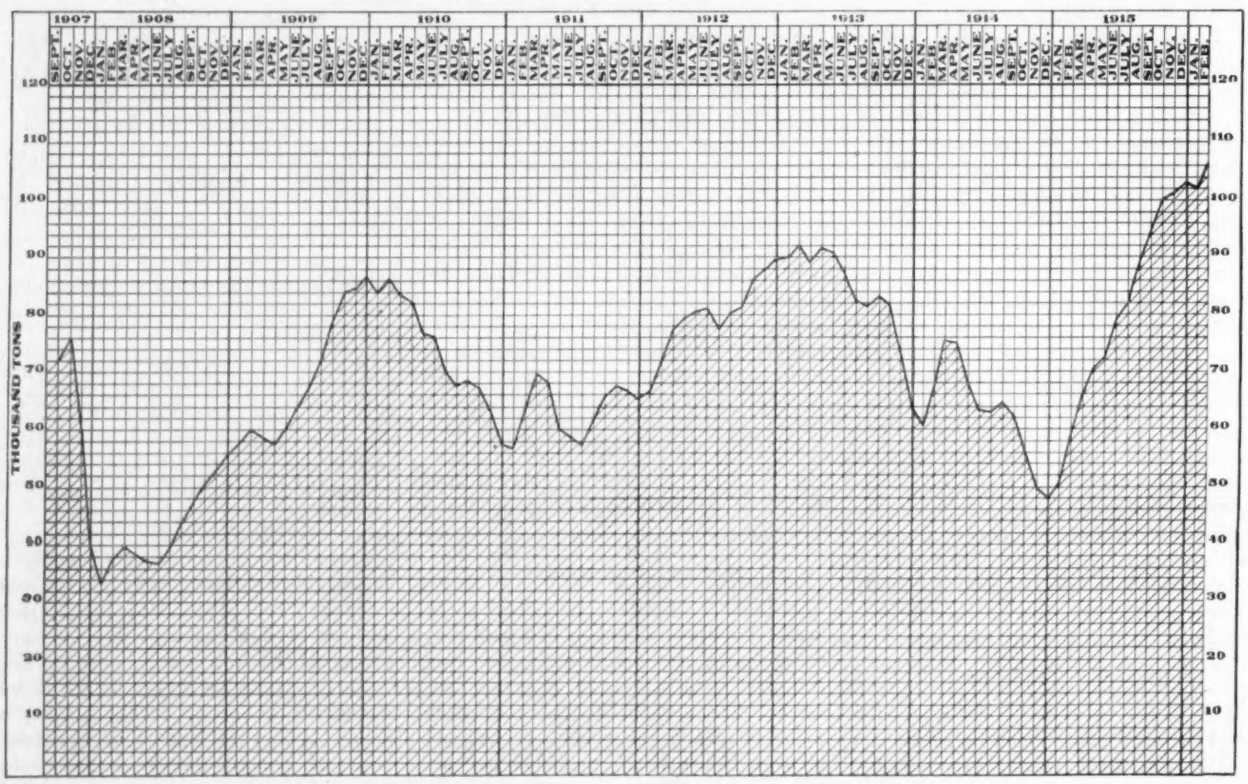
The total value of exports of iron and steel in January, 1916, amounted to $51,643,807, compared with $18,053,421 in January, 1915, and $45,825,277 in December, 1915.

IRON AND STEEL EXPORTS, GROSS TONS.

	January, 1916.	January, 1915.	Seven months end'g January, 1916.	Seven months end'g January, 1915.
Scrap	16,681	1,327	75,495	10,610
Pig iron.....	18,719	8,862	156,022	52,275
Bil'ts, ingots & bl'ms of steel	55,315	16,046	419,179	39,598
Wire rods....	8,104	9,127	98,052	32,504
Steel rails....	38,122	8,864	334,909	73,859
Steel bars....	58,400	17,933	317,534	81,358
Iron bars....	5,996	391	36,411	3,410
Struc. iron & steel.....	19,482	10,833	162,221	89,300
Hoops, band and scroll...	3,400	1,021	22,577	6,045
Sh'ts & plates.	36,953	21,426	287,734	138,374
Tin and terne plates	12,177	7,014	119,705	40,013
Barbed wire..	33,962	9,530	193,002	67,552
All oth. wire.	15,448	9,501	141,200	56,349
Cut nails.....	229	217	2,764	1,163
Wire nails...	10,999	5,837	67,453	26,220
All oth. nails includ. tacks	525	197	6,126	1,987
Pipes & fit'gs.	14,840	10,678	106,917	105,944
R. R. spikes.	1,792	214	12,530	3,149
Bolts, nuts, rivets & wash'rs	2,336	985	18,761	7,374
Horseshoes..	786	416	8,918	5,702
Cast radiators	150	128	1,508	1,863
Total 354,416	140,547	2,589,018	844,649	

George W. K. Taylor, resident of the McMann & Taylor Co., New York City, died suddenly on March 5 at his home at 890 Park place, Brooklyn. Mr. Taylor was born in that city 60 years ago and was a graduate of Cooper Union. He was a member of the New York Chamber of Commerce, the Merchants' Association, the Machinery club and was a director of the Greenwich bank.

The Toledo Bridge & Crane Co. has moved its Detroit office to 709 Kresge building.



AVERAGE DAILY PRODUCTION OF COKE AND ANTHRACITE PIG IRON

Pig Iron Output Shows Big Gain

Average Daily Production in February Breaks All Records—Number of Active Furnaces is Largest in More Than Eight Years

THE blast furnaces of the country continue to disclose an inherent producing capacity, unsuspected even a few months ago. In the face of the hard campaign that many stacks have undergone during the past year, the average daily production of coke and anthracite pig iron during February was the highest ever attained. While some stacks, particularly those controlled by steel works interests, are being put out each month for relining and repairs, more furnaces are resuming and February's record may stand for only a short time.

MONTHLY PRODUCTION.

	1916.	1915.	1914.
January	3,171,878	1,591,024	1,879,336
February	3,078,548	1,666,592	1,888,607
March		2,046,280	2,341,551
April		2,114,518	2,261,501
May		2,255,157	2,097,019
June		2,369,932	1,904,566
Total 1st half		12,043,503	12,372,580
July		2,563,311	1,955,324
August		2,774,825	1,996,483
September		2,834,342	1,882,718
October		3,120,340	1,767,227
November		3,035,235	1,501,269
December		3,201,605	1,495,325
Total 2d half		17,529,658	10,598,346
Grand total	6,250,426	29,573,161	22,970,926

The actual output last month was 3,078,548 tons against 3,171,878 tons in January, a decrease of 93,330 tons. The decline resulted wholly from the shorter month and the average daily production figures furnish the correct indices to the rate of operation maintained during each month. In February, the furnaces produced daily 106,157 tons against an average of 102,319 tons in January, a gain of 3,838 tons. The previous record was set in December, at 103,278 tons.

The furnaces in blast on Feb. 29 numbered 312, the largest total since December, 1909, and excepting that month, since October, 1907. The net gain in active stacks was eight, the merchant interests contributing five and the steel works three. Six merchant were relighted and one blown out, while seven non-merchant furnaces were blown in and four put out.

The steel works furnaces made the largest comparative gain during the month. The production of non-merchant iron during February was 2,208,155 tons against 2,271,271 tons in January, a loss of 63,116 tons. In average daily production, however, the February figure is 76,143 tons, compared with 73,267 tons in January, a gain of 2,876 tons. The total production of merchant iron last month was 841,080 tons against 875,212 tons in January, a loss of 34,132 tons. The average daily output of merchant iron last month was 29,003 tons against 28,233 tons in January, a gain of 770 tons.

The production of ferro last month was 21,094 tons, compared with 16,727 tons in January, a gain of 4,367 tons. The February output of spiegel was 8,219 tons, against 8,668 tons in January, a loss of 449 tons.

Among the merchant furnaces blown in last month were: Clifton No. 1, Alabama Co., Feb. 1; Pioneer No. 1, Republic Iron & Steel Co., Feb. 8; Iroquois "B", Iroquois Iron Co., Feb. 17; Hokendauqua No. 3, Thomas Iron Co., Feb. 7, and Rockdale, J. J. Gray Jr. The Detroit Iron & Steel Co. blew out one of its Detroit stacks during the month.

The steel works furnaces blown in were: Minnequa "E", Colorado Fuel & Iron Co., Feb. 15; South Works, No. 7, Illinois Steel Co., Feb. 4; Maryland No. 1, Maryland Steel Co., Feb. 19; Duluth No. 2, Minnesota Steel Co., Feb. 19; Niles, Feb. 23, and one Edgar Thomson, Feb. 14, Carnegie Steel Co., and Coatesville No. 2, Worth Bros. Co., Feb. 10. Those blown out were: Ensley No. 4, Tennessee Coal, Iron & Railroad Co., Feb. 29; Gary No. 8, Indiana Steel Co., Feb. 4; one Bellaire, Carnegie Steel Co., Feb. 1, and Lorain No. 3, National Tube Co., Feb. 4.

The Berkshire Iron Works, Sheridan, Pa., expects to light its stack about March 20.

The resumption of No. 1 stack at the Sparrows Point plant of the Maryland Steel Co., on Feb. 19, places all of that company's furnaces on the active list.

The Sam Lanham stack at the state penitentiary, Rusk, Tex., has recently been overhauled and relined, according to H. M. Ellis, warden.

AVERAGE DAILY PRODUCTION.

	1916.	1915.	1914.	1913.	1912.
Jan.	102,319	51,323	60,624	89,929	66,220
Feb.	106,157	59,521	67,450	92,095	72,372
Mar.		66,009	75,534	89,123	77,791
Apr.		70,484	75,383	91,812	79,254
May		72,747	67,646	90,865	80,753
June		78,998	63,486	87,229	81,125
July		82,687	63,075	82,525	77,502
Aug.		89,510	64,403	81,839	80,650
Sept.		94,478	62,757	83,137	81,482
Oct.		100,656	57,007	81,933	86,569
Nov.		101,174	50,042	74,322	87,985
Dec.		103,278	48,236	63,746	89,590
Av'r'ge	104,174	81,022	62,934	83,980	80,124

FEBRUARY PIG IRON

States.	No. of stacks.	No. in blast last day of month. Feb.	Jan.	Total tonnage made. Merchant.	Non-Merchant.	Totals—Feb.	Jan.
Pennsylvania	155	131	127	248,785	1,055,698	1,304,483	1,362,621
Ohio	73	63	64	189,894	482,354	672,248	668,140
Alabama	45	27	26	151,612	74,982	226,594	226,945
Virginia	22	9	9	34,289	.....	34,289	35,268
New York	26	20	20	83,208	109,501	192,709	195,978
New Jersey	6	0	0	.....	.....	.....	4,471
Illinois	26	23	21	41,543	257,276	298,819	309,750
Colorado	6	3	2				
Indiana	10	9	10	32,901	188,801	221,702	241,870
Maryland	4	4	3				
Wisconsin	6	5	5				
Kentucky	7	3	3				
West Virginia	4	3	3	35,174	25,634	60,808	62,565
Tennessee	18	8	7				
Washington	1	0	0				
Georgia	2	0	0				
Texas	3	0	0				
Minnesota	3	3	2	23,674	13,909	37,583	38,875
Michigan	3	1	2				
Missouri	1	0	0				
Spiegel—All states...						8,219	8,668
Ferro—All states....						21,094	16,727
Totals	421	312	304	841,080	2,208,155	3,078,548	3,171,878

Will Discuss Rails

The seventeenth annual convention of the American Railway Engineering Association will be held at the Congress hotel, Chicago, March 21-23, inclusive. On Tuesday evening, March 21, Robert W. Hunt will present an illustrated paper on "Nick and Break Test in the Inspection of Steel Rails." A report will be submitted Tuesday by the standing committee on iron and steel structures. The committee on rails will report Thursday. The annual dinner will be held Wednesday evening at 6:30.

Reynders Resigns Position

Vice President and Director of Pennsylvania Steel Co. Steps Down—President Grace Issues Statement

No little surprise was caused in the iron and steel industry on Tuesday, when J. V. W. Reynders, vice president and director of the Pennsylvania Steel Co., Steelton, Pa., resigned his position, to take effect in three months. Mr. Reynders' plans for the immediate future are not known. "I desire to be free from personal responsibility for a time," he declared, "in order to examine several propositions which have been brought to my attention during the past few years; in fact, I may not be able to reach a definite conclusion as to future activities for some time to come."

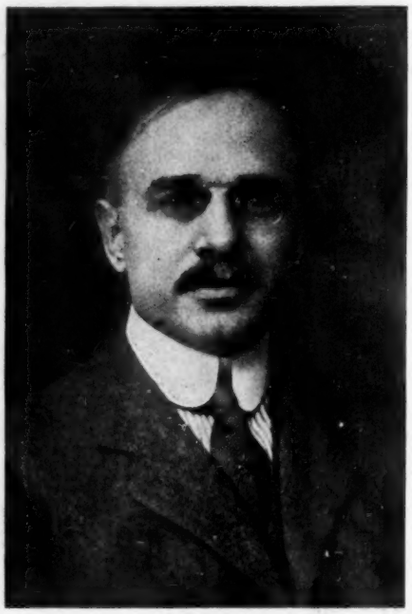
Mr. Reynders and President E. G. Grace ,of the Bethlehem Steel Co., South Bethlehem, Pa., which recently acquired a controlling interest in the Pennsylvania company, are warm personal friends, this fact contributing to the general surprise elicited by the former's resignation. Quincy Bent, present assistant to the president at the Maryland Steel Co., Sparrows Point, Md., has been named as general manager of the Steelton plant, but will not be a successor to the duties of Mr. Reynders, inasmuch as the Pennsylvania company will in future be directed from South Bethlehem.

"The resignation of Mr. Reynders," said President Grace on Tuesday, "must not be considered as any reflection upon his ability or his services to the company. He and I are very warm personal friends and I have a high opinion of his ability and know full well that it was he who made Steelton what it is today. Mr. Reynders resigned of his own volition. He is a big man in the steel business and during our recent visit to Steelton we were much pleased and impressed both with what he has done in a constructive way and with his conduct of the big enterprise.

"Of course, you will understand that we will absorb completely the Pennsylvania Steel Co., and as one of its chief executive officers, Mr. Reynders goes with the others, but I wouldn't have anybody think that there is anything but the best of good feeling between us.

"There are no other changes to announce. It is not our purpose to put new blood into the plant at Steelton. What we desire to do is to take the present organization and build for the future from that. There is a big opportunity ahead for advancement there. We have no desire to make any changes. First of all, it is our purpose to give every man at Steelton full and ample opportunity to make good under the new management ,and it is our sincere hope that there will be not one failure."

Mr. Reynders, who was born in Hoboken, N. J., has been with the Pennsylvania Steel company since 1892, and first attracted attention in steel circles as an expert in bridge construction and erection. He is a graduate of a German gymnasium and of Renssalaer Polytechnic Institute at



J. V. W. REYNDERS,
Vice President and Director, Pennsylvania Steel Co.

Troy, N. Y., and upon graduation immediately entered the service of the Pennsylvania Steel Co. as engineer in charge of the bridge and construction department. In 1896 he was made superintendent of the bridge and construction department. In this position he continued until 1906 when he was placed in complete charge of the works at Steelton and elected vice president and director of the company, which positions he has since held.

During the period of his superintendency of the bridge and construction department and since his elevation to the vice presidency, Mr. Reynders has made a wonderful record as a bridge engineer. Some of the biggest works of that kind in the whole world were turned out of the Steelton plant and erected by Steelton engineers, among them the Blackwell's Island and Williamsburg bridges, New York; the gigantic Gokteik viaduct in Burmah, the Niagara arch and the Memphis bridge, now in course of construction.

(For complete prices see page 568.)

Furnace Coke

Is Strong — One Important Consumer Closes for Last Six Months

Pittsburgh, March 7.—Blast furnace coke reflects strength. Spot fuel is selling at $3.75 a ton at the ovens and some dealers are asking as high as $4, ovens. One important consumer has just closed negotiations for second half requirements, paying $3, ovens, for a rather heavy tonnage of standard furnace coke. Cokemakers are asking from $3 to $3.50, ovens, for second half delivery. One seller has announced that he will refuse to sell at less than $3.25, ovens, for shipment after July 1. Specification for 72-hour coke are coming out in heavy volume and the tendency of prices is upward. The *Connellsville Courier*, for the week ending Feb. 26, says production of coke in the upper and lower Connellsville regions was 445,260 tons, an increase of 24,585 tons, compared with the week previous.

Foundry Coke Advancing

Cincinnati, March 6.—The coke market is very strong. Large tonnages of foundry grades are being sold for early requirements beginning July 10. Spot furnace coke is in good demand, but is very scarce. Prices are gradually growing firmer. Wise county contract coke is now quoted at from $3.50 to $4, ovens, New River contract foundry at from $3.75 to $4.25, ovens, and New River contract furnace coke at from $3.25 to $3.50, ovens.

Higher at Buffalo

Buffalo, March 7.—With coke prices fully $1 a ton higher than were quoted at this time a year ago, consumers of foundry and other grades of coke are coming into the market for their contract needs over the ensuing year, fully three months ahead of the customary time for negotiating coke purchases on the yearly contract basis. Sellers report that most of the users of foundry coke feel that it is advisable to place their contracts at this time, owing to the shortage of labor in the coke fields.

The Lackawanna Iron & Steel Co. has blown in its second Colebrook blast furnace at Lebanon, Pa.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

Benjamin Nicoll, of B. Nicoll & Co., New York City, has resigned as a director of the Denver & Rio Grande railroad.

Henry T. Leaming, assistant general manager, and Ernest J. Berggren, secretary-treasurer, of the Thomas A. Edison Co., Inc., Orange, N. J., have resigned.

George Schuhmann, vice president and general manager of the Reading Iron Co., Reading, Pa., has returned from a two-weeks' business trip to Cuba.

Albert E. Heustis, for 10 years vice president and secretary of the Bruce-Heustis Electric Co., Fitchburg, Mass., has severed his connection with the company.

A. J. Brosseau, general manager of the Gale Mfg. Co., Albion, Mich., has been elected vice president of the Federal Motor Truck Co., Detroit, having taken up his new duties Feb. 1.

Malcolm Farmer, mill superintendent of the Phoenix Iron Works, Phoenixville, Pa., was presented a gold watch by his associates upon his departure to take up a similar position at New Britain, Conn.

George Davies, 120 Broadway, New York, eastern sales agent for the Davies & Thomas Co., Catasauqua, Pa., has returned to his office after a vacation of one month, spent in Cuba and Florida.

John W. Harrington, of the Harrington & Richardson Arms Co., Worcester, Mass., has returned from a two-months' trip to France and England, the third he has made since the outbreak of the European war.

William Wallace Johnston, formerly resident salesman of the Carnegie Steel Co., at Toledo, O., has accepted the position of purchasing agent for the American Shipbuilding Co., Cleveland, succeeding Norman S. Thrasher.

Frank M. Bump, Raynham, Mass., and Charles G. Wood, New Bedford, Mass., members of the Massachusetts state board of conciliation and arbitration, who have settled many industrial disputes in that state the past few years, have announced that they would shortly resign and open a bureau for the same purpose. The reason given is that the $2,500 salary is insufficient.

J. P. Beck has been appointed manager of the Portland Cement Association with offices in the Conway building, Chicago. He formerly was publicity manager for the Universal Portland Cement Co.

H. C. Brown Jr., assistant engineer for the Illinois Central railroad at Chicago, has resigned to become sales engineer of the Chicago Bridge & Iron Works, with offices at 37 West Van Buren street, Chicago.

Benj. G. Fernald, who has been manager of the New York office of the Kerr Turbine Co., Wellsville, N. Y., has been made a director and vice president of the company. Mr. Fernald's office will be at 95 Liberty street, New York City.

Fred S. Easterly, for several years assistant purchasing agent of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., now is traffic manager of the Ohio Iron & Metal Co., with offices in the Farmers Bank building, Pittsburgh.

Raymond S. Coe, for three years in charge of the advertising department of the Landers, Frary & Clark Co., New Britain, Conn., has accepted the position of assistant advertising manager of the Norton Co., Worcester, Mass., succeeding Arthur F. Clough resigned.

E. L. Cushman has been elected treasurer of the Cushman Chuck Co., Hartford, Conn., of which he is president, to succeed his son, Richard Cushman, resigned, and Charles G. H. Schomacher has been elected assistant treasurer. Arthur E. Cushman has joined the company.

Thos. Benton, formerly in charge of the marine department of the Pennsylvania railroad, has been elected president of the Standard Shipbuilding Corporation, which is operating a plant at Shooters island, N. Y. W. S. Cahill of Baltimore, has been made a director.

R. W. Clark, of the New York office of Rogers, Brown & Co., presented the moving picture lecture of his company, "From Mine to Molder", before the New York School of Mines, Columbia University, New York City, on March 6. On March 7, Mr. Clark exhibited the picture before the Park Avenue Methodist Episcopal Church, New York City.

Samuel K. Pierce has resigned as assistant treasurer of the New England Structural Co., Boston, Mass., to become treasurer of the John W. Cowper Co., Buffalo. Having taken an interest in the latter company, Mr. Pierce assumed his new position on March 1.

J. G. Miller, for the past several years general sales agent of the Adrian Furnace Co. and of the Punxsutawney Furnace Co., has been admitted to partnership in the firm of Reed, Fears & Miller, New York and Boston, pig iron, coke, etc. An office has been opened at Du Bois, Pa., with Mr. Miller in charge.

Leroy D. Peavey, vice president of the Babson Statistical Organization, addressed the New England Foundrymen's Association at the Exchange club, Boston, on Wednesday evening, March 8, on the subject, "Anticipating Business—Law of Action and Reaction". The usual dinner followed the address.

F. H. Moyer has been appointed chief engineer of the Cambria Steel Co., Johnston, Pa., to succeed E. W. Clarke, recently appointed superintendent of the rolling mills of the company. Mr. Clarke succeeded Charles E. Duncan, who now is identified with the Donner Steel Co., Buffalo.

C. Louis Allen, former sales manager of the Pyrene Mfg. Co., New York City, has been made president of the company. Mr. Allen is 32 years of age and has been with the company since April 1, 1914. He began work as a salesman, five months later was made general manager of sales, and last June was placed in charge of the advertising department.

Carl H. Glaser, who recently completed the apprenticeship course at the Homestead Steel Works of the Carnegie Steel Co., has been appointed an assistant to George W. Vreeland, superintendent of the blast furnace plant of the Carnegie company at Mingo Junction, O. Mr. Glaser graduated from the Case School of Applied Science in 1912.

Gustav Adolphe Trube, head of the French Westinghouse Air Brake Co., who was recently excluded from France, is now at Pittsburgh. Mr. Trube says his expulsion was the result of misapprehension on the part of French government officials. "I do not know of any reason for it, unless it is my German name," Mr. Trube said.

High Car Prices

Are Responsible for Failure of Railroads to Place Orders

New York, March 7. — Builders now are quoting 50-ton freight cars at from $1,400 to $1,500, each, which compares with $1,000 to $1,100 in recent normal times and as low as $650 during conditions of depressed trade. This offers eloquent explanation why a number of the railroads are holding off from closing for much-needed equipment after they inquire and receive the prices from the shops. On a large equipment order now pending for the Russian state railways, builders are quoting from 100 to 110 per cent higher than the prices at which they accepted the original orders from that country, several months ago. A heavy demand for equipment continues from the railroads, from 15,000 to 20,000 cars and many locomotives now being in the market but scarcity of steel and high prices are holding back awards.

Interest of foreign railroads in American equipment is the feature of the situation. The Russian government railways will buy 15,000 to 18,000 cars additional, it is expected, if the present negotiations for a large loan materialize. Many of these foreign inquiries now are before builders in more definite form. Among these are the following:

French state railways, 2,000 gondolas, 1,000 flats, 500 box and 1,500 box car parts.

Paris-Lyons-Mediterranean railway, 300 to 400 tank cars and 500 box car parts.

American Trading Co., 1,500 to 2,000 flats for either China or Japan.

Canton-Hankow railway of China, 150 gondolas and 40 flats.

Malang-Stroomstram-Maakchuppij-Amsterdam road, 50 freight cars.

The Pressed Steel Car Co. has taken 50 box cars for the Tientsin-Pekin railway and 25 general service cars for the Cie des Forges et Acieries de la Marine et d'Horecourt.

Domestic car orders the past week have been very light. The Philadelphia & Reading has a new inquiry for 500 hoppers.

Foreign orders for locomotives booked by the American Locomotive Co. include 18 for the Central of Brazil; eight for the State Railways of Java; two for Cerro de Pasco; one each for the Iuclimane Railway and Alto Cedro Sugar Co. From domestic roads, the same builder has 77 for the Chicago & North-Western and two for the Buffalo Creek railway. The Frisco is inquiring for 50.

Rail Business Moving

A western and a southern system which recently placed some tonnage of rails for 1917 delivery with Steel Corporation mills, are negotiating for additional tonnage for that period with other makers. The Maryland Steel Co. will furnish 10,000 tons of the recent orders placed by the Southern Railway for late this year. The Lackawanna Steel Co. received 2,000 tons. The Bethlehem Steel Co. has received 3,000 running rails and will receive such part of 10,000 tons of contact rails as will be placed by the New York Municipal railways. The Baltimore & Ohio has bought 2,500 tons additional for this year's delivery. It is expected that the 15,000 tons for the government's Alaskan railway, bids for which went in at Seattle this week, will go to the Colorado mill.

The Lehigh Valley railroad has placed an order for 20 additional locomotives of the Mikado type with the Baldwin Locomotive Works. Since Oct. 1 last, this road has ordered 40 large freight and 15 switching locomotives.

Track Equipment

Pittsburgh, March 7. — Standard railroad spikes now are selling at a range from 2.50c to 2.65c and the regular extras are being quoted for smaller spikes. Track bolts, which sold at as low as 1.85c in the autumn of 1914, now are listed at 3.25c. Rail joints and angle bars are in heavy demand and prevailing prices are firmly maintained.

Selling Rails For 1917

Chicago, March 7. — Considerable tonnages of standard steel rails have been contracted already for rolling in 1917. A considerable tonnage is pending at present, about 35,000 tons being on inquiry by a large western line.

Track bolts have been advanced by an important maker to a range of 3.25c to 3.50c, Chicago. This is the second advance within a week, about 50c being added in the two advances. Railroad spikes remain at 2.60c to 2.75c, Chicago, and tie plates at $45 to $48, Chicago.

Large inquiry is constantly before the trade for this class of material, as railroads are taking large tonnage and appearing anxious to accumulate stock for fear of a famine later in the year.

Car Orders Placed

Chicago, March 7.—The Chicago & North-Western railroad has placed 1,000 automobile cars and 500 stock cars with the Western Steel Car Co. and 500 box cars with the American Car & Foundry Co.

(*For complete prices see page* 568.)

Pipe Demand

Is Extremely Active—Order for 40 Miles of Gas Line Placed

Pipemakers are facing an enormous demand for oil country goods. The strength of the oil market in this country coupled with the extensive developments being undertaken in Mexico and other foreign countries has brought about the heavy demand. The inquiries being received are in greater volume than at any previous time. Development work is particularly active in Mexico, and the inquiries from that country call for big tonnages of large-sized pipe. A steady demand is also in evidence for merchant pipe. Gas lines are expected in the market shortly, one order for 40 miles of 6-inch gas line being placed a few days ago. The advanced prices, announced a week ago, on both iron and steel pipes and boiler tubes, have been firmly established and makers predict a further advance before the second quarter. The Philadelphia Co., a conspicuous buyer of iron and steel pipe the past few weeks, has entered the market for ten miles of 6-inch steel pipe.

Shell Contracts

Have Been Closed by Belligerents—Will Extend Into Next Year

New York, March 7.—Some important additions to shell contracts, it is learned, have been closed by foreign belligerents during the past week with large industrial companies which now are completing original orders for munitions, placed some months ago. One of the contracts just placed is for ammunition for the British and Russian governments and deliveries are to begin after July 1 and run into next year. A large tonnage of steel now is under negotiation for this requirement. J. P. Morgan & Co. have inquired for as large a tonnage of 6½, 7½ and 10-inch blooms, as makers can supply. It is understood this steel is for British howitzers.

Two Millions

Will be Spent at Cambria Plant—Sharp Price Advance

New York, March 8. (By wire.)—Improvements to be made to Cambria properties by Midvale Steel & Ordnance Co. officially announced here will include one additional blast furnace, a number of by-product coke ovens and the development of coal properties. The outlay will be something over $2,000,000.

Some eastern shape mills yesterday advanced $5 to a minimum of 2.50c, Pittburgh with premiums for special accommodation.

Fig. 1—Panel No. A-1, July 10, 1914

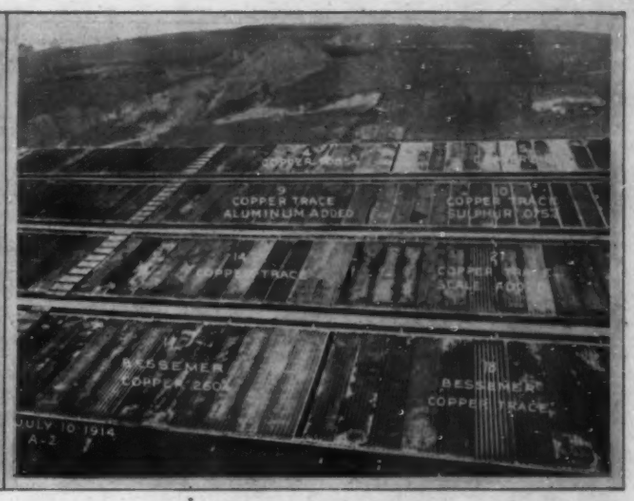


Fig. 2—Panel No. A-2, July 10, 1914

Research in Corrosion Resistance

A SERIES of interesting tests supplementing data presented in The Iron Trade Review, June 10, 1915. These investigations indicate that copper tends to increase the resistance of steel and iron to atmospheric corrosion. For commercial purposes steel containing 0.25 per cent is considered most satisfactory

BY D. M. BUCK AND J. O. HANDY

IN ORDER to obtain definite information relative to the influence of varying amounts of copper and other elements when alloyed with steel, an extended series of service tests was undertaken by the authors in the spring of 1914. Details of these experiments were published in *The Iron Trade Review*, June 10, 1915, pages 1155 to 1165. Following this work, which was conducted by Mr. Buck, the authors continued the practice of conducting the tests on full size, uncoated sheets, under exact service conditions, extreme care being taken to so plan the work that whatever differences might be found in the various grades of steel used, they could safely be ascribed to the influence of the particular element which had been added.

In addition to repeating work which has already been done on the effect of the addition of approximately 0.25 per cent of copper, we have included in the tests covered by this article, steels with a copper content as low as 0.04 per cent, as well as steels with higher amounts up to and including 2 per cent.

As will be seen from the accompanying tables, we also made additions of phosphorus, silicon, aluminum, sulphur, roll scale, and, following a suggestion by a colleague—that the addition of cold steel to the middle ingots of the heat would cause them to outlast the first poured ingots, a similar amount of cold steel turnings was

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A paper read at the annual meeting of the American Society of Mechanical Engineers, New York.

D. M. Buck is metallurgical engineer, American Sheet & Tin Plate Co., Pittsburgh, and J. O. Handy, who collaborated with Mr. Buck, is director of laboratories, Pittsburgh Testing Laboratory, Pittsburgh.

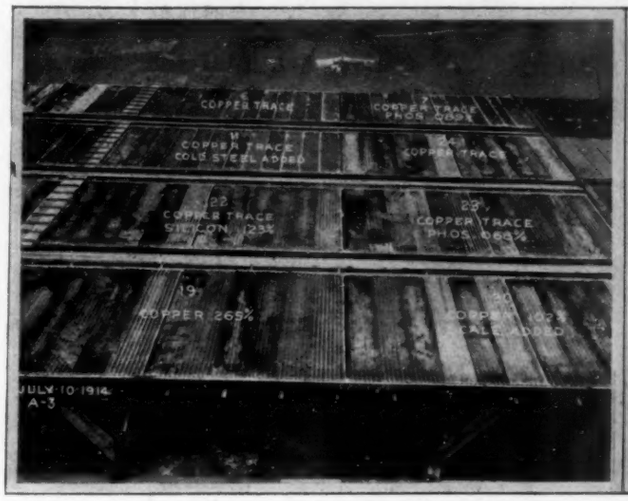


FIG. 3—PANEL NO. A-3, JULY 10, 1914

FIG. 4—PANEL NO. B-1, FEB. 16, 1915

added to one of the ingots, in exactly the same manner in which the copper had been added to the others.

Some work also had been done on the influence of annealing temperatures higher than the average practice. We have kept careful records of inside and outside sheets of the pack, and of the presence or absence of mill scale on the surface of the sheets at the time of exposure, to determine whether or not these differences in initial protection affected the ultimate time of failure of the sheets.

Several Heats Employed

Several heats of open hearth and bessemer steel were used in the tests and the following table gives the additions as they were made. It will be noted that in one instance, 10 ingots were used from a single heat, and that they differed one from the other only in the amount and kind of alloying element which was added. In later tables we give the final analyses of the sheets rolled from these ingots. The grade numbers given below are used throughout this paper. The grade numbers, ingot numbers and additions are as follows:

Basic Open Hearth Heat No. 6807.

Grade No.	Ingot No.	Addition.
1	1	None made. Ingot not used.
2	2	Copper, aiming at 0.25 per cent.
3	3	Copper, aiming at 0.50 per cent.
4	4	Copper, aiming at 1.00 per cent.
5	5	Copper, aiming at 2.00 per cent.
6	6	Plain steel. No addition. Used for test.
7	7	Phosphorus aiming at 0.100 per cent.
8	8	Silicon, aiming at 0.300 per cent.
9	9	Aluminum, 8 ounces.
10	10	Sulphur, aiming at 0.100 per cent.
11	11	Cold steel, 16 pounds.

Basic Open Hearth Heat No. 8815.

Approximately one-half of this heat was run into a ladle and copper added aiming at 0.25 per cent.

Grade No.	Ingot No.	Addition.
12	2	Copper to ladle; aimed at 0.25 per cent.

The remainder of the heat was run into another ladle without copper addition, and while casting, copper was added to one ingot.

Grade No.	Ingot No.	Addition.
13	2	Copper to mold; aimed at 0.25 per cent.
14	3	Plain steel. No addition.

High Sulphur Bessemer Heat (Residual, Not Added, Sulphur.)

Grade No.	Ingot No.	Addition.
15	.	Copper, aiming at 0.25 per cent.
16	.	Plain steel. No addition.

Normal Bessemer Heat.

Grade No.	Ingot No.	Addition.
17	.	Copper aiming at 0.25 per cent.
18	.	Plain steel. No addition.

Basic Open Hearth Heat No. 7750.

In the manufacture of this heat, an effort was made to produce a wild, oxidized heat. The steel was melted hot; ore was fed faster than usual and continued, even after carbon had been reduced to 0.12 per cent. Silica sand was added instead of dolomite. The heat had a very wild appearance, rose strongly in the molds, and in addition, we had a running stopper in the ladle which gave a divided stream; this, of course, favored oxidation. Analyses of the sheets from this heat by the Ledebuhr method showed an oxygen content averaging only 0.03 per cent, which is no higher than normal open hearth steel.

Grade No.	Ingot No.	Addition.
19	4	Copper aiming at 0.25 per cent.
20	6	Copper as above, and roll scale, 20 pounds.
21	7	Roll scale 20 pounds.
22	8	Silicon aiming at 0.10 per cent.
23	9	Phosphorus aiming at 0.10 per cent.
24	3	Plain steel. No addition.

Basic Open Hearth Heat No. 8857.

This heat was made without the addition of manganese or other deoxidizer at any stage.

Grade No.	Ingot No.	Addition.
25	2	Plain steel. No addition.
26	3	Copper approximating 0.35 per cent.

Basic Open Hearth Heat No. 8805.

This heat corresponds to heat No. 6807, (grade Nos. 2 to 11 inclusive, and the same additions were made in exactly the same way and in the same order. The composition is quite similar to No. 6807 *except that the copper (residual)* is about 0.04 per cent in all grades except those to which copper was added. Comparing the results on sheets from this heat with those from heat No. 6807, we obtain information relative to the influence of comparatively small copper contents. The grade numbers for heat No. 8805 are the same as for No. 6807 except that an X has been added to each.

Basic Open Hearth Heat No. 7699.

This heat corresponds to heat No. 8815 and the additions were the same. This heat, however, *continued* 0.05 *per cent, residual copper.* The grade numbers are 12X, 13X and 14X.

Methods of Sheet Manufacture

All of the operations of blooming, rolling, sheet rolling, etc., were conducted according to regular mill practice and were under the personal supervision of the authors. Enough sheet bars were taken from the product of each ingot to give us a large excess of sheets for our tests. The bars were taken from the piles at such points as to represent the whole ingot from top to bottom, thus securing the average product of the ingot. All grades were given exactly the same treatment in all of the manufacturing operations, and each sheet received the customary one-straightening pass through the cold rolls.

All sheets, except those which were annealed at higher temperature, were annealed at one time in the same furnace, thus securing uniform heat treatment.

Uniform Heat Treatment

To determine the possible influence of higher annealing temperature, one-half of the sheets of grade Nos. 2 to 14, inclusive, were annealed at a temperature about 200 degrees Fahr. higher than the normal temperature for sheets. The remainder of the sheets of these grades and all other grades were annealed at the usual temperature.

After the annealing process the sheets were laid out in piles and the 24 sheets required for our tests were taken at regular intervals from the piles, an average product thus being obtained.

Each sheet was stamped with a distinguishing mark, and they were numbered consecutively from 1 to 24. In the case of the grade Nos. 2X to 14X, inclusive, and also grade Nos. 25 and 26, six sheets of each were selected in the same manner as above, and were numbered from 1 to 6. All sheets were 26 gage, 26 x 96 inches.

A strip 2 inches wide was cut lengthwise from each sheet, and these strips were given the same distinguishing numbers as the sheets from which they were cut, and were sent to the laboratories, where each one was carefully analyzed.

As soon as this work had been completed, and we were thus assured that no mistakes had been made in marking the sheets, they were corrugated and forwarded to Scottdale and McKeesport, Pa.

Twelve sheets of each of grades Nos. 2 to 24, inclusive, were exposed at each station, while the other grades, Nos. 2X to 14X, 25 and 26, were exposed at McKeesport only.

There had meanwhile been obtained in the open market, from three different sources, three lots of one of the so-called pure iron sheets, which on analysis proved to have a copper content of 0.041 per cent. Several sheets of each lot were taken and exposed exactly as received, without pickling or cleaning of any kind. This has been the invariable practice on all corrugated sheets of all grades in this test and in all previous tests of this character which were made by Mr. Buck. All of the grades above mentioned,

Discussion Invited

The comprehensive series of tests presented herewith embody conclusions of interest to every manufacturer and user of sheet steel products. The data included in this article have never been published before and are offered by the authors as a contribution to the extensive and important literature of corrosion. The aim has been to deal with the subject from a practical rather than from a purely theoretical standpoint. The conclusions regarding the usefulness of small test pieces are specially interesting. Realizing that many questions regarding corrosion are not yet considered settled by engineers and metallurgists, The Iron Trade Review invites discussion of this paper.

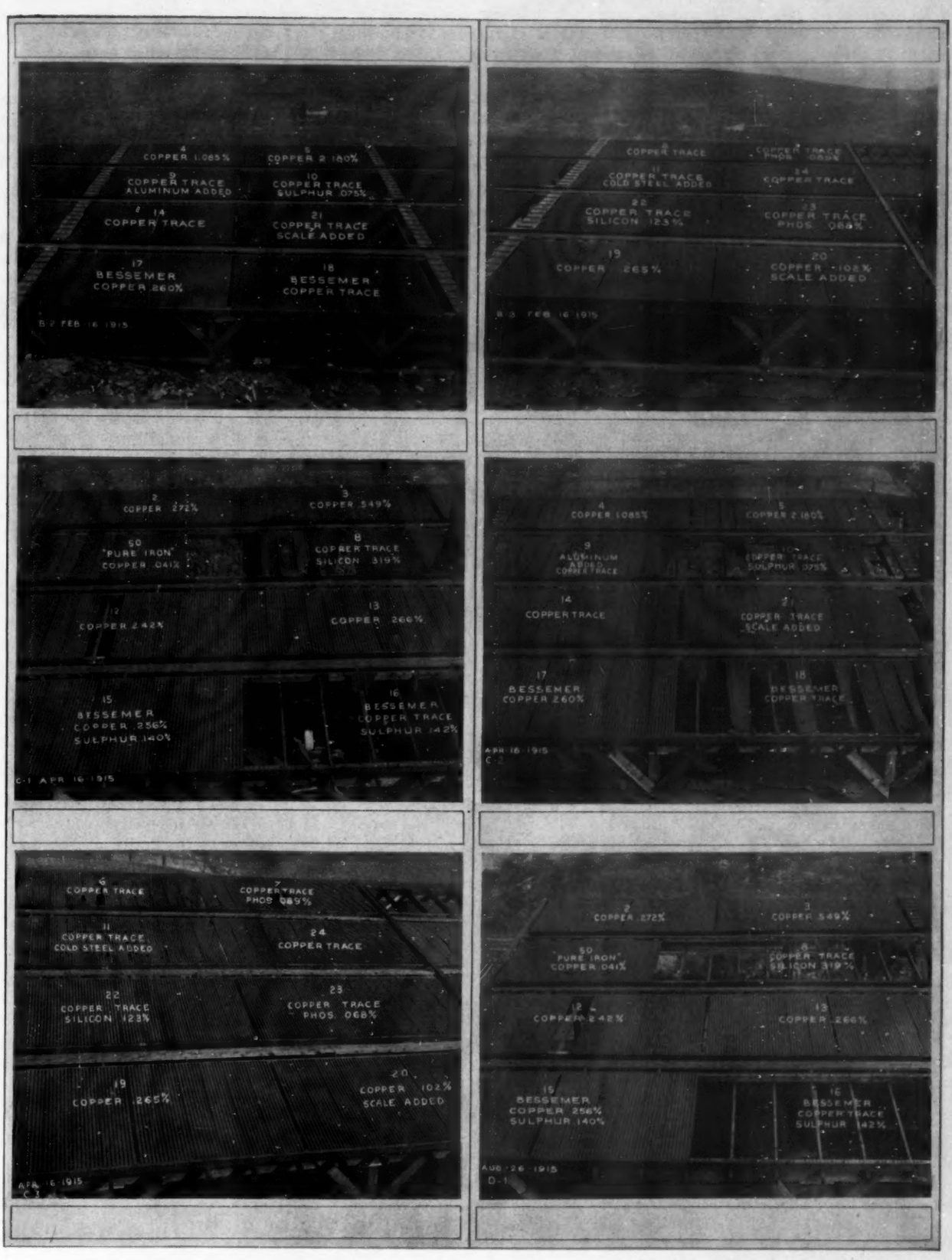


FIG. 5—PANEL NO. B-2, FEB. 16, 1915
FIG. 7—PANEL NO. C-1, APRIL 16, 1915
FIG. 9—PANEL NO. C-3, APRIL 16, 1915

FIG. 6—PANEL NO. B-3, FEB. 16, 1915
FIG. 8—PANEL NO. C-2, APRIL 16, 1915
FIG. 10—PANEL NO. D-1, AUG. 26, 1915

including the so-called pure iron, grade No. 50, were exposed as roof panels at McKeesport on July 7, 1914, and at Scottdale on July 9, 1914. At approximately the same time that the full size sheets were exposed, a series of 2 x 4-inch test pieces cut from the 2-inch strips before mentioned, and consisting of one piece from each sheet, 636 pieces in all, was exposed. These test pieces were cleaned by a very light wash of sulphuric acid, dipped in ammonia water to neutralize all acid, then thoroughly washed, dried, weighed and arranged in wooden racks in such a manner as to afford all free and equal exposure to the weather. The method of removing, cleaning and weighing these test pieces will be discussed later. The results obtained are given in the various tables submitted herewith.

Referring, for the present, to the full size corrugated sheets shown in the accompanying illustrations, careful notes were taken at the time of exposure concerning the physical appearance of the sheets as affected by the amount of mill scale which was present, and as to whether they were outside or inside sheets of the packs. During the progress of the test, this feature was carefully watched, and the time of ultimate failure of sheets whose surfaces were comparatively free from mill scale was compared with others of the same grade, whose surfaces were well covered with mill scale. From these observations, we concluded that the influence of this original surface oxide is slight, and is lost in the early stages of rusting, for no differences in final failure could be noticed.

In the cases of panels 2 to 14, inclusive, one-half, six sheets, of each grade were from the lot which had been annealed at approximately 1,400 degrees Fahr., and the other six from the lot annealed at approximately 1,600 degrees Fahr.

The illustrations presented herewith were taken from time to time during the tests, and show in a graphic manner the progress of the corrosion at various stages.

Careful inspections of the sheets were made approximately once every two months, and at the first inspection, distinct differences were noticed in the physical conditions of the various panels. The corrosive action of the atmosphere had produced a decided difference in color, the steels with a copper content of 0.25 per cent or more being distinctly darker than the others which contained only a trace of copper. At the same time, these dark brown panels were smoother to the touch than the others, and the rust was denser and more adherent. Inasmuch as this same phenomenon had been noticed in former tests, it was indicated even at this early stage, which steels would be the most resistant. It was also noted that several of the panels to which ingredients other than copper had been added, for instance, sulphur and aluminum, gave indications that the rate of corrosion was proceeding even faster than with those steels to which no additions had been made.

The fact that such early inspections are valuable, and that the relative merits of the various steels and irons can be predicted with fair accuracy, is borne out by the results of later inspections, and by the order of failure of the various panels.

The peculiar piebald appearance of the sheets (photographs were taken immediately after exposure of the sheets) in Figs. 1, 2 and 3, is caused by the irregular distribution of mill scale. The outside sheets show a uniform dark color while the inside sheets are light in the areas where mill scale was absent and vice versa.

It will be noted that the 12 sheet panels have been divided into two panels of six sheets each. In the cases of grades Nos. 2 to 14, inclusive, the left half of these consists of sheets annealed at 1,400 degrees, while those in the right half were annealed at 1,600 degrees. In all other cases the two halves received identical treatment.

Table I.
SHOWING LOSS IN OUNCES PER SQUARE FOOT PER MONTH FOR EACH PERIOD OF EXPOSURE IN BOTH TESTS AT SCOTTDALE AND McKEESPORT

Grade	Carb.	Mang.	Sul.	Phos.	Silicon	Copper	Annealing Temp.	SCOTTDALE 6.5 Months	SCOTTDALE 9.53 Months	SCOTTDALE Average	McKEESPORT 8.2 Months	McKEESPORT 10.0 Months	McKEESPORT Average	Grand Average	Rank	Element Added
2	.06	.41	.039	.032	.004	.272	1400	.1411	.1361	.1386	.1134	.1057	.1095	.1241	9	Copper
							1600	.1405	.1382	.1393	.1041	.1045	.1043	.1218		Copper
3	.06	.43	.045	.041	.004	.549	1400	.1423	.1345	.1384	.1089	.1047	.1068	.1226	8	Copper
							1600	.1374	.1338	.1356	.1043	.0961	.1002	.1179		Copper
4	.07	.43	.039	.036	.004	1.085	1400	.1389	.1319	.1354	.1039	.1007	.1023	.1188	3	Copper
							1600	.1375	.1353	.1364	.0991	.0962	.0976	.1170		Copper
5	.06	.42	.042	.040	.004	2.180	1400	.1314	.1294	.1304	.1005	.0941	.0973	.1138	1	Copper
							1600	.1332	.1303	.1317	.0966	.0905	.0935	.1126		Copper
6	.06	.45	.047	.035	.004	.018	1400	.3723	.4202	.3962	.1843	.2215	.2029	.2996	19	None
							1600	.2632	.3831	.3231	.1634	.2007	.1820	.2526		None
7	.06	.44	.047	.089	.009	.016	1400	.3040	.3564	.3302	.1589	.1682	.1635	.2469	16	Phosphorus
							1600	.2692	.3258	.2975	.1460	.1620	.1540	.2257		Phosphorus
8	.06	.41	.045	.034	.319	.016	1400	.3521	.4747	.4134	.2016	.2027	.2021	.3078	20	Silicon
							1600	.3186	.3909	.3547	.1527	.1656	.1593	.2569		Silicon
9	.06	.43	.047	.036	.007	.017	1400	.3764	.4732	.4248	.2103	.2335	.2219	.3233	22	Aluminum
							1600	.3591	.4758	.4174	.1932	.1890	.1911	.3043		Aluminum
10	.06	.43	.075	.028	.008	.019	1400	.4327	.5144	.4735	.2341	.2926	.2633	.3684	24	Sulphur
							1600	.4211	.5206	.4708	.1960	.2464	.2212	.3460		Sulphur
11	.05	.44	.037	.030	.003	.014	1400	.3746	.4538	.4142	.1923	.2204	.2063	.3103	21	Steel
							1600	.3023	.3693	.3358	.1717	.1823	.1770	.2564		Steel
12	.06	.46	.028	.035	.003	.242	1400	.1386	.1381	.1383	.1073	.1030	.1051	.1217	5	Copper
							1600	.1406	.1394	.1400	.1107	.1056	.1081	.1241		Copper
13	.06	.56	.034	.033	.010	.266	1400	.1388	.1401	.1394	.1043	.1064	.1053	.1224	7	Copper
							1600	.1431	.1377	.1404	.1079	.1073	.1076	.1240		Copper
14	.08	.60	.035	.032	.006	.014	1400	.3344	.3477	.3410	.1785	.1745	.1765	.2588	17	None
							1600	.2729	.3104	.2916	.1788	.1914	.1851	.2384		None
15	.06	.50	.140	.093	.006	.256		.1332	.1458	.1395	.1022	.1020	.1021	.1208	4	Copper
16	.06	.47	.142	.096	.004	.008		.4221	.5018	.4619	.2547	.2353	.2450	.3535	23	None
17	.07	.48	.048	.112	.012	.260		.1280	.1358	.1319	.1028	.0963	.0995	.1157	2	Copper
18	.07	.49	.052	.112	.010	.004		.3301	.3911	.3606	.1895	.1922	.1908	.2757	18	None
19	.07	.29	.029	.016	.009	.265		.1403	.1366	.1384	.1074	.1037	.1055	.1220	6	Copper
20	.06	.31	.039	.018	.005	.102		.1469	.1478	.1473	.1155	.1125	.1140	.1307	10	Cop. & Scale
21	.06	.26	.030	.017	.005	.014		.2849	.2984	.2916	.1649	.1711	.1680	.2298	14	Scale
22	.06	.29	.033	.018	.123	.016		.3026	.3342	.3184	.1604	.1606	.1605	.2394	15	Silicon
23	.06	.29	.035	.068	.006	.015		.2366	.2571	.2468	.1406	.1476	.1441	.1955	12	Phosphorus
24	.06	.30	.027	.016	.004	.014		.2752	.2939	.2845	.1677	.1684	.1680	.2263	13	None
50	.02	.03	.031	.005	.002	.041		.1588	.1577	.1582	.1156	.1178	.1167	.1375	11	

Storm Severs Loose Ends

Referring to Figs. 13, 14 and 15, an unusually severe wind storm occurred at Scottdale on Nov. 18, 1915, which blew away all fragments of sheets which were hanging by one end, only those sheets remaining which were in good condition and which still contained a considerable amount of uncorroded metal. The rate of corrosion of the various grades may be observed by studying Figs. 1-15 of the Scottdale test, and Figs. 16-25 of the McKeesport test.

We call particular attention to Figs. 13, 14 and 15 of the Scottdale test, taken Dec. 1, 1915, 17 months after the test was erected. At this time every panel to which copper has been added is intact. While the corrosion at McKeesport was somewhat slower than at Scottdale, yet by a study of the photographs and tables, it will be seen that the relations between the various grades are approximately the same.

It has been claimed that tests made by determining the losses in weight on exposure of comparatively small test pieces are inaccurate and misleading. A study of the tables which we present herewith, showing the weight losses due to corrosion of the various grades of steel and iron, in the shape of 2 x 4-inch test pieces, together with the illustrations showing the conditions of the large size sheets, will

FIG. 11—PANEL NO. D-2, AUG. 26, 1915
FIG. 12—PANEL NO. D-3, AUG. 26, 1915
FIG. 13—PANEL NO. E-1, DEC. 1, 1915
FIG. 14—PANEL NO. E-2, DEC. 1, 1915
FIG. 15—PANEL NO. E-3, DEC. 1, 1915
FIG. 16—PANEL NO. F-1, AUG. 24, 1915

Table II.
SHOWING LOSS IN OUNCES PER SQUARE FOOT PER MONTH FOR EACH PERIOD OF EXPOSURE

Grade	Carbon	Manganese	Sulphur	Phosphorus	Silicon	Copper	McKEESPORT 8.2 Months	McKEESPORT 10.9 Months	Average	Element Added
2X	.06	.49	.033	.029	.004	.290	.1033	.1057	.1045	Copper
3X	.04	.45	.033	.033	.004	.555	.1021	.1035	.1028	Copper
4X	.05	.46	.033	.031	.004	.990	.1038	.1022	.1030	Copper
5X	.05	.46	.031	.025	.011	1.940	.1001	.0979	.0990	Copper
6X	.06	.48	.034	.032	.002	.041	.1293	.1296	.1294	None
7X	.06	.46	.039	.085	.003	.040	.1187	.1210	.1198	Phosphorus
8X	.06	.43	.028	.030	.332	.036	.1352	.1267	.1309	Silicon
9X	.06	.47	.032	.029	.006	.037	.1241	.1301	.1271	Aluminum
10X	.06	.46	.082	.028	.004	.044	.1493	.1810	.1651	Sulphur
11X	.06	.46	.033	.032	.010	.037	.1257	.1314	.1285	Steel
12X	.06	.53	.033	.033	.004	.270	.1046	.1012	.1029	Copper
13X	.06	.41	.031	.022	.006	.314	.1072	.1047	.1059	Copper
14X	.06	.41	.031	.024	.006	.050	.1173	.1167	.1170	None
25	.06	.15	.032	.012	.005	.017	.1922	.2195	.2058	None
26	.06	.16	.030	.012	.004	.404	.1096	.1055	.1075	Copper

prove that the results accord remarkably, and that the weight losses correspond to the relative endurance of the large sheets.

In these experiments, we have adopted the practice of removing and cleaning one-half of the small test pieces after the lapse of several months, allowing the others to remain exposed for some time longer. This was done in an effort to determine if there was any tendency of the rust film to behave differently on different sheets. It was thought that the sponge-like rust which is normally formed on non-copper steels might accelerate corrosion more than the dense adherent film on copper steels. That this idea was right, is shown by the results. We will discuss this feature at greater length a little later.

To clean the rust from the test pieces before final weighing, we used an ammoniacal solution of ammonium citrate. This solution completely removes the rust in about 12 hours, with the minimum attack upon the underlying metal.

Careful experiments show that the attack on bare iron and steel by the above solution is practically nil. On rusted pieces, due no doubt to electrolysis, it is a little greater, but still negligible compared with the total losses obtained. Furthermore, it is approximately the same on all grades used in this test. This is further substantiated by the fact that the order of final failure of the large sheets coincided almost exactly with the weight losses obtained on the small pieces, by this method.

We will not burden this report with details of the various inspections or with detailed tables showing losses of individual test pieces, but will present tables of summaries giving average results. The losses are in each case expressed in ounces per square foot of exposed surface per month, and the results are averages of from six to 12 determinations in each case. Complete detailed notes may be found at the authors' offices, and are available to anyone who wishes to study them.

Table I summarizes the results on all grades which were exposed in both locations, and compares losses during the total of each period of exposure and also grand averages. The column headed "Rank" gives the order of resistance to corrosion of the various grades, No. 1 being best, and No. 24, poorest. In this ranking we have compared only those grades annealed at 1400 degrees Fahr. In this list there are 10 grades to which copper was added in amounts from 0.25 per cent to 2 per cent. In grade No. 20, the steel was so wild that it was very difficult to add the copper properly, and some was lost. These have taken the 10 highest positions.

In these grades there is a remarkable uniformity in the corrosion rate, the greatest loss being 0.1307 and the lowest 0.1138 ounces per square foot.

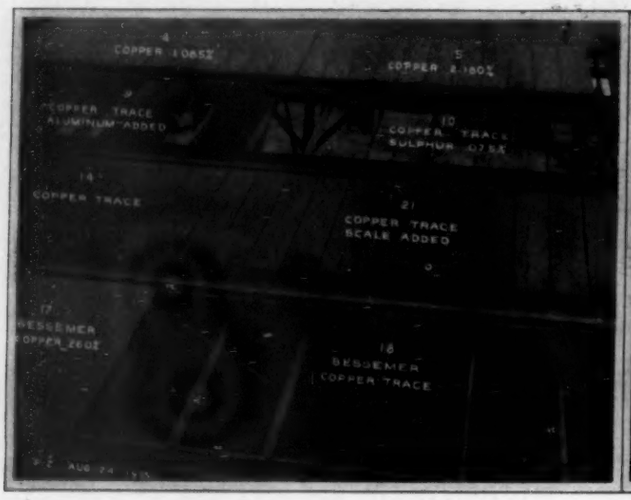


FIG. 17—PANEL NO. F-2, AUG. 24, 1915

FIG. 18—PANEL NO. F-3, AUG. 24, 1915

FIG. 19—PANEL NO. G-1, AUG. 24, 1915
FIG. 21—PANEL NO. H-1, DEC. 23, 1915
FIG. 23—PANEL NO. H-3, DEC. 23, 1915

FIG. 20—PANEL NO. G-2, AUG. 24, 1915
FIG. 22—PANEL NO. H-2, DEC. 23, 1915
FIG. 24—PANEL NO. I-1, DEC. 23, 1915

Table III.
AVERAGE CORROSION PER MONTH, BOTH PERIODS, GRADES NOS. 2 TO 50, BOTH TEMPERATURES
(From Table I.)

SCOTTDALE	McKEESPORT
.2596	.1502

Average Corrosion of Copper Steels per month—Both Temperatures

SCOTTDALE	McKEESPORT
1376	.1037

Average Corrosion of all others per month—Both Temperatures

SCOTTDALE	McKEESPORT
3528	.1857

Table IV.
AVERAGE CORROSION PER MONTH FROM GRAND AVERAGE COPPER STEELS
(From Table I.)

Average Corrosion per month from grand average Copper Steels (From Table 1)

1400 Degrees	1600 Degrees
.1206	.1196

Average Corrosion per month of all other grades—

1400 Degrees	1600 Degrees
.3021	.2686

Higher amounts than 0.25 per cent copper give slightly better results, but the difference is so small as to be negligible, especially when considering the added cost.

The so-called pure iron with a copper content of 0.041 per cent takes eleventh place, while the other grades which have only the usual traces of copper take positions from 12 to 24; the poorest being those to which sulphur was added, No. 10, and which contained high sulphur residually, No. 16, the latter showing losses approximately three times as great as the copper steels.

The addition of aluminum, silicon and cold steel in each case has slightly increased the corrosion rate, compare Nos. 9, 8 and 11 with No. 6. A phosphorus addition has somewhat lessened the corrosion; compare No. 7 with No. 6 and No. 23 with No. 24. This is in line with some of our previous work.

Grades Nos. 19 to 24, although from a heat which was supposed to be highly oxidized, have shown somewhat lower losses than the other heats. From other work we have done, we ascribe this to the somewhat lower sulphur content; compare Nos. 6 and 14 with No. 24.

In studying the results on grades Nos. 15, 16, 17 and 18, bessemer, we note the accelerating effect of very high sulphur. At the same time, the addition of 0.25 per cent copper to the same steel has entirely neutralized this influence and the results are quite comparable to normal copper steels.

Considering Table II, grades Nos. 2X to 14X, to which the same additions were made as to Nos. 2 to 14, Table I, we find that as low a copper content as 0.04 per cent seems to have materially lessened corrosion. Compare No. 6X with No. 6, also No. 14X with No. 14, and No. 10X with No. 10, etc. From the latter we learn that 0.04 per cent copper partially neutralizes the influence of sulphur as high as 0.082 per cent.

Panel No. 25, from a heat to which no deoxidizer was added, and which was comparatively low in manganese, shows a corrosion rate greater than that of normal basic open hearth steels, indicating no benefit because of lower manganese but a possible detriment, from the steel not having been deoxidized. Panel No. 26 from the same heat but with copper addition is quite the equal of other steels to which copper was added.

Coke Regions Hard on Sheets

Table III indicates the relative rates of corrosion in the two different atmospheres, of all varieties of steel tested. On plain steels we find that the corrosion in the coke regions, that is, at Scottdale, is nearly twice as great as that at McKeesport in a normal mill district. The difference is very much less when considering copper bearing steels, the ratio being approximately as follows:

All steels—100 at McKeesport to 173 at Scottdale.
Copper steels—100 at McKeesport to 133 at Scottdale.
Plain steels—100 at McKeesport to 190 at Scottdale.

From Table IV we learn that the benefit of higher annealing temperatures in the case of plain steels is approximately 12 per cent greater endurance, while for copper steels it is practically negligible.

In determining the losses of the weighed test pieces, the authors adopted the practice of removing them from the racks at different periods. At the end of these periods which were 6½ and 8 1/3 months, respectively, we removed one-half of the test pieces and cleaned and weighed them. The remaining half we left exposed for approximately three months longer, at the end of which time they also were taken down, cleaned and weighed. Various conclusions may be drawn from a study of corrosion rates during these two periods of exposure.

In Table V, in the Scottdale test, we notice that in the first period, the rate of corrosion of copper steels was 0.1379 ounce per square foot, and of the same steels in the second period, 0.1369 ounce, showing that the corrosion rate does not increase for successive periods of exposure, while with the plain steels, we find a decided increase in the second period over the first, viz.: 0.3383 ounce in the first to 0.5122 ounce in the second, a 51 per cent increase in corrosion rate. Similar results were obtained in the Demmler test as indicated by the figures in the table.

Sheet steel or iron containing copper shows greatly increased corrosion resistance when exposed to atmospheric conditions. The most effective amount of copper to be used for this purpose is believed to be approximately 0.25 per cent. Smaller amounts of copper down to as little

Table V.
COMPARISON OF COPPER STEELS AND OTHER GRADES, USING GRADES NOS. 2 TO 24 IN EACH PERIOD OF EXPOSURE
Results are average corrosion per month in ounces per square foot.
(From Table I.)

	SCOTTDALE		McKEESPORT	
	Copper Steels	All Others	Copper Steels	All Others
1st Period	.1379	.3383	.1066	.1875
2nd Period	.1369	.5122	.0917	.2343

as 0.04 per cent have a considerable influence in lessening corrosion, but the results are not as good as with the higher amount mentioned above. Work previously done by one of the authors has indicated that 0.15 per cent copper is in nearly all cases as efficient as 0.25 per cent. Higher amounts of copper up to 2 per cent give little or no added benefit. Copper is believed to be as necessary, in the so-called "pure irons", to insure corrosion resistance as it is in normal open hearth and bessemer steels.

The addition of phosphorus to open hearth steel slightly lowers the corrosion rate. Silicon, while probably without effect in the amounts normally present in the open hearth and bessemer steels, accelerates corrosion when added in amounts from 0.10 to 0.30 per cent. The addition of small amounts of aluminum probably has little influence on corrosion. These tests indicate it to be harmful rather than beneficial.

The addition of sulphur to steel greatly increases the corrosion rate and when residually present in abnormal amounts, it is probably also detrimental from a corrosion standpoint.

The addition of cold steel to molten steel does not lower the corrosion rate, but, if it has any influence at all, it is to increase the corrosion.

Results obtained by loss in weight determinations on small test pieces are found to be accurate and valuable when determining the relative corrosion resistance of various sheet metals. The method of cleaning such test pieces with ammoniacal citrate solution is found to be the most convenient and accurate thus far investigated.

The Great Western Smelting & Refining Co., J. B. Neiman, manager, announces that it has removed its Detroit offices to 1714-1718 David Whitney building.

Our Dyestuff Industry

American dye works are now turning out coal tar colors at the rate of 15,000 tons annually, and a report on the present dyestuff situation just issued by the bureau of foreign and domestic commerce calls attention to the importance of the fact that these colors are being manufactured wholly from American raw material. Before the war started we manufactured only 3,300 tons of coal tar colors, made mostly from imported intermediates. The report points out, however, that the total imports of artificial colors before the war was something like 25,000 tons, so that the color-using industries even now are not getting near their normal supplies. The necessity for continued effort on the part of all concerned in the establishment of an American dyestuff industry is apparent.

The manufacture of coal tar crudes in this country has assumed large proportions, states Dr. Norton, the author of the report, but owing to the great demand for such products in the manufacture of explosives the dye works have not had the supplies they needed. Nevertheless, there are now 17 firms engaged in manufacturing intermediates and 12 firms are turning out the finished dyes. One of the features of the bureau's report is an up-to-date list of the firms engaged in these lines.

Will be Permanent

It is Dr. Norton's opinion that the United States is to have a permanent dyestuff industry. The textile and allied industries, he says, are united in the determination that the country shall not again be exposed to such a famine as it has recently experienced. The large organizations of dyestuff users have expressed a willingness to bear the burden of higher prices than prevailed before the war, if necessary. Most of the companies engaged in manufacturing coal tar compounds are planning to continue their production along the lines already taken up and to enlarge such production or enter upon the manufacture of additional intermediates or finished dyes as circumstances warrant.

Annealing Bronze

A study has just been completed by the bureau of standards, department of commerce, of the annealing of bronze, using the commercially important alloy, zinc-bronze (copper 88, tin 10, zinc 2), as a type. The results have been published in technologic paper No. 60, just issued. The properties of cast steel may be greatly improved by refining the grain by proper annealing. The changes occurring in cast brasses and bronzes upon annealing are regarded in the same light by many metal workers. The results of the bureau's study show that bronze is very different in its behavior from steel and shows no recrystallization or grain-refining unless it has been previously cold worked as by rolling or hammering. Copies of the publication entitled "Microstructural Changes Accompanying the Annealing of Cast Bronze", may be obtained without charge from the bureau of standards, Washington, D. C.

FIG. 25—PANEL NO. 1-2, DEC. 23, 1915

The European war is seriously crippling the system of education in chemistry in America, is the statement made by Prof. John S. Van Nest, of Princeton University's chemical department. Some of the laboratory chemicals upon which the instructors are dependent are unobtainable and prices of others have increased an average of 140 per cent since the war began. Laboratory apparatus is also hard to obtain. One of the most used chemicals is bromide, while platinum has increased in three months from $41 to $100 an ounce.

Discusses Motor Control Problems

IN THE ACCOMPANYING spirited discussion of L. C. Brooks' article on "Electric Control for Machine Tools," which appeared in the March 2 issue of The Iron Trade Review, Mr. Stratton declares that an appreciation of operating characteristics by controller engineers is urgently needed at present

BY H. F. STRATTON

THE subject of electric operation and automatic control for machine tools is one that interests me strongly, for to the best of my knowledge I made the first automatic controller intended to be generally applicable to motor-driven machine tools. It is true that an automatic controller for motor-driven planers was built 13 years ago, but the reversing planer controller was then, and is now, an equipment specially designed for use with one tool. About six or seven years ago, the series accelerating switch was discovered, and its obvious cheapness and simplicity at once suggested that the time had arrived for applying, in a broad way, automatic control to motor-driven machine tools generally. Accordingly, about five years ago, a controller was designed and built which included a train of series accelarating switches, and an operator's switch, by means of which the motor could be automatically started, reversed or stopped by dynamic braking. This controller, substantially in its original form, has come into extensive use and today there are thousands of them operating successfully on a large variety of machine tools.

Summary of Mr. Brooks' Paper

IN THE early application of electric motors to machine tools, the motors were started by hand starters. While there are a number of cases in which these starters are still more applicable, we have reached the time when automatic starters, remote controlled, are the most suitable.

Some of the advantages of automatic control are as follows: The operating switch is easily attached to the machine, and the main panel may be located at a distant point. The starting time of the machine is automatically regulated to suit the load conditions on the motor. Accurate stopping points are obtained by "dynamic braking". All panels should be provided with a fool-proof enclosing case which meets all the applicable safety first requirements. Automatic starters and control apparatus should be provided with protection from low voltage on the line, also from excessive overload. The three general types of automatic starters are TIME ELEMENT, COUNTER ELECTRO-MOTIVE FORCE *and* CURRENT LIMIT. *Starters for small motors consist of line contactor; overload relay, field rheostat and connecting board. For larger motors, where one step of resistance is necessary, they include line switch and fuses, contactor, counter electromotive force accelerating contactor and connection board. For still larger motors the latter is modified to accommodate the additional accelerating contactors.*

At the present time, the problem of purely automatic control for general lathes has not been entirely solved, although lathes for a special class of work have been controlled with safety and efficiency. Automatic control equipment has been applied to boring mills, planers and slotters. Not the least important factor in the successful operation of an electrically controlled machine is the motor. For small printing presses, ventilating fans, small machine tools, woodworking machines, etc., the shunt motor is applicable, and for adjustable speed work it is suitable for planers, boring mills, heavy lathes, etc. The series motor should always have a certain friction load, and is thus applicable to centrifugal pumps, cranes and hoists.

In the second paragraph of his paper, Mr. Brooks touches rather lightly on several important matters. I am not exactly certain of his meaning, so that possibly the statements following may merely reaffirm his affirmations. First, neither the synchronous motor nor the induction motor in its commercial form, is an adjustable speed motor. Second, if we except a few continuous running machines, fully 95 per cent of the machinery and cranes of the steel industry are driven by direct current motors. Third, the small speed increment obtainable is only one of several important advantages of the adjustable speed direct current motor over the alternating current motor as applied to machine tools. Certainly other important advantages are, a wide speed range, which may easily be four to one; a constant speed, with any given setting of the rheostat, regardless of the load; quick starting or reversing without excessive currents, and the ease with which the motor may be temporarily converted into a generator and with which it may be stopped by dynamic braking. Certainly there can be no disputing the statement that the adjustable speed direct current motor excels the alternating current motor for the machine tool with individual drive. Mr. Brooks next paints a word picture of a man manipulating a drum type or a dial type hand starter, and from this picture he passes on to the advantages of automatic control. I agree that the automatic controller possesses the advantages mentioned, but I am eager to put more emphasis on the main issue. What we are after is to keep the machine at work for the maximum amount of time and at its maximum speed. Other seeming advantages are advantages in reality only when they yield tribute to this principle of increased capacity. It is true that automatic control protects the motor, but that is important chiefly because it saves delays; automatic control provides stopping by dynamic braking, but that, too, is important, chiefly because unproductive time is transmuted into productive effort; it is true that the workman is relieved of much mental and physical effort, but that is important chiefly because he does more work. This is a matter of manufacturing economics, rather than of engineering technique.

Mr. Brooks next refers briefly to the characteristics of time element acceleration, counter electromotive force acceleration and current limit acceleration. In his digest, he apparently recommends counter electromotive force acceleration for motors with one step of resistance, and in his paper he declares that "the reliability of the counter electromotive force system is decreased by the fluctuation in line voltage, except in the case of

motors of small capacity". I agree that it is unreliable, but the unreliability is due more to the changes in temperature of the coil than to fluctuations in the line voltage. Very briefly, such a system includes a shunt operated contactor, with the coil terminals connected across the armature; the contactor is designed to close at a certain number of ampere turns, which are determined by the voltage on the shunt coil and its resistance. Now, the cold resistance of this coil may easily be 10 per cent to 20 per cent less than its hot resistance. The result is that before the contactor will close the voltage on the coil—and hence the speed of the motor—must be 10 per cent to 20 per cent greater when the coil is hot than when it is cold. The same principles apply to a small motor, as well as a large motor, so I cannot see why counter electromotive force acceleration is good enough for even small motors unless it is on the general theory that it is permissible to abuse small motors. As Mr. Brooks has himself admitted that the counter electromotive force system of acceleration is unreliable, and as he mentions no compensating advantages for it, I do not see why he does not favor the universal use of current limit acceleration. There are thousands of small motors with current limit accelerations, and I see no good reason against its universal use.

Prefers Series Contactors

Concerning the two types of current limit acceleration, Mr. Brooks' point should be emphasized. Wherever possible, use series contactors in preference to shunt contactors and accelerating relays, because of their greater simplicity, their almost total absence of fine wire coils and control circuits, their absence of small control circuit contacts, lesser space, lesser cost and smaller amount of apparatus. Mr. Brooks very properly brings out the advantages of enclosing the electrical equipment.

Under the heading "Starters for Constant Speed Motors", Mr. Brooks proceeds to discuss the starting of an adjustable speed motor, and even speaks of moving the field rheostat handle to get the desired motor speed. I merely point out this error because, in considering problems of control, it is a mistake not to be accurate and precise in considering the motors which are controlled. I refer to the standardization rules of the American Institute of Electrical Engineers, wherein an adjustable speed motor is defined as one "in which the speed can be varied gradually over a considerable range, but when once adjusted remains practically unaffected by the load."

Mr. Brooks states that "a double pole line contactor should be supplied". In some cases probably it should and in other cases it should not; it all depends on what is wanted. A single pole line contactor disconnects the motor from one side of the line but at some time it may refuse to open; a double pole line contactor disconnects the motor from both sides of the line, but it is just as apt to stick closed as the single pole contactor; two single pole contactors disconnect the motor from both sides of the line, and it is almost a certainty that both contactors will not stick at the same time. In this matter, the more one is willing to pay for the greater safety is insured. Mr. Brooks declares that contactors should be used to connect the motor to the supply lines, or to reverse it, or to establish dynamic braking. I disagree entirely with these statements. An enclosed type of operator's switch can be used, which when moved to different positions, establishes the motor circuits, which provide starting, reversing or dynamic braking. This switch is easily mounted and operated, will last almost indefinitely and is in extensive and satisfactory use in sizes up to 35 horsepower. By its use considerable simplicity is gained and not one automatic feature is sacrificed. Under the heading "Protective Features" it is stated that fuses and not overload relays should furnish overload protection for motors below 25 horsepower. It ought to be apparent to any one that this matter cannot be disposed of by such a sweeping generality. What is there peculiar about the 25-horsepower size of motor calling for overload relays above it and fuses below it? Certainly this is a matter of service conditions. If the load on even a 5-horsepower motor is such that overload protection is needed several times a day, it is obvious that time and money will be saved by the use of circuit breaker protection instead of fuse protection.

Should Keep Line Switch With Panel

Mr. Brooks states "in many cases it will be preferable to have the line switch and fuses a part of the distribution system, separate from the control panel", but he does not explain why. It may be preferable in some cases, but in the majority of cases it is more convenient to have the knife switch mounted integrally with the control panel, there being thus only one equipment instead of two to install and the wiring between the knife switch and the control panel being eliminated, so far as the user is concerned.

Mr. Brooks also states that a field accelerating relay should be supplied with motors above 5 horsepower and with a speed adjustment of two to one the field relay is not necessary, except in special cases, and that "with adjustable speed motors of a range greater than two to one, provision should always be made so that the field resistance is not cut in until the last accelerating contactor has closed".

Disagrees With Specifications

These statements are somewhat conflicting, but I take it that collectively they specify the following conditions: First, with adjustable speed motors having a speed range greater than two to one, a contact should be provided on the last accelerating switch, which short circuits the field rheostat until this switch has closed. By inference this contact is not needed on adjustable speed motors of less than two to one speed range. Second, the field accelerating relay may be omitted between 5 and 50 horsepower, if the speed range of the motor is not greater than two to one, and, by implication, the relay should be used on motors larger than 50 horsepower even if the speed range is less than two to one. I prefer to look at this matter differently and to consider compound and shunt wound motors as calling for different specifications covering the field accelerating relay. With a compound motor it is generally satisfactory to omit the field accelerating relay entirely by the use of the following connections: Maintain the excitation of the series field, and full shunt field strength until the motor is directly connected to the supply lines and then at the same time short circuit the series field winding and introduce the field rheostat in series with the shunt field in one step. The damping effect of the short circuited series field delays the dying down of the field flux to such an extent that, in nearly all cases the motor has ample time to accelerate to high speed without excessive armature current.

In the case of the shunt motor, I should recommend the use of the field accelerating relay for practically all motors of 5 horsepower or larger, and with a speed range of 1½ to one or more. I should recommend the omission of the contact on the last accelerating contactor to short circuit the field rheostat, and instead of this connection to place the field accelerating relay directly in the armature circuit and allow it to func-

tion as soon as the armature is connected to the supply lines in series with all of the starting resistance.

There are a good many angles to this question and there is one important point which I think is not brought out by Mr. Brooks. No doubt an adjustable speed motor with a range of 1½ to one or even two to one can be satisfactorily started by an automatic controller without the use of a field accelerating relay, even with the field rheostat set at a position of maximum speed. This, however, is on the assumption—which is frequently unwarranted—that sufficient torque is developed by the motor on a weak field to start the load. The armature current is limited by the ohmic value of the starting resistance and the predetermined action of the accelerating contactors. With the armature current thus limited, and with the field at one-half full strength, only one-half to three-quarters of the full load torque will be developed, and this may not be sufficient to start the machine. If the field accelerating relay had been included, a full field would have been provided at starting and the motor would have developed at least its full load torque. I know of an installation of a 5-horsepower motor where, without a field accelerating relay, the motor would not develop sufficient torque to start the machine, even when the field rheostat was set to give a speed only 15 per cent in excess of the slowest speed.

Disconnecting Motor Fields

It is stated that provision should be made so that the motor fields are not energized when the machine is not in use. I agree that it is preferable to disconnect the motor fields when the machine is shut down for a considerable length of time, as at noon, or during the night. I do not believe, however, that the fields on machine tool controllers, as a rule, should be disconnected from the line every time the machine is stopped. It requires an appreciable length of time for the shunt field to build up to its full strength, and if this building-up process occurs during the time that the motor is being started, the result is a weaker average field and an increased starting interval. On work of frequent starting and stopping, more current is wasted in this way than would be saved by disconnecting the shunt fields. What is more serious, the productive time of the machine is diminished.

Mr. Brooks suggests that "with adjustable speed motors the arrangement should be such as to prevent a pump back when stopping the motor". I take it that this means that we should not permit regenerative currents, due to a sudden increase in the current in the shunt field winding while the motor is still running at high speed. I agree with this most heartily and would point out that the most effective way to prevent it is to separate the operations of starting, reversing or dynamic braking from the operations of speed control. This is one of the vital objections to the drum controller which has, in addition to the limitations of manual acceleration, the great disadvantage that heavy and damaging regenerative currents are caused every time the drum controller is moved quickly from a position of relatively high speed to the off position.

Removal of Contactor Parts

Mr. Brooks believes that a 300-ampere contactor should be good for 1,500,000 operations without renewal of parts, while 500,000 operations would be satisfactory for a 25-ampere contactor. Now, in a general way, a 300-ampere contactor would be used on a 75-horsepower controller and a 25-ampere contactor on about a 5-horsepower controller. On ordinary machine tool work, a 5-horsepower motor is apt to be started and stopped a good deal more frequently than a 75-horsepower motor. It therefore seems to me that these specifications conform more to the way in which the contactor happens to be designed than they do to the requirements of the work.

It is stated that operation should be satisfactory with a voltage variation 5 per cent above and 20 per cent below the normal. If 230 volts is considered normal, this gives operating limits of voltage of 184 and 242. This may be sufficient in many cases, but I have found there are numerous installations requiring voltage limits of 175 and 250.

The number of steps of starting resistance as given by Mr. Brooks form too extended a topic to discuss in much detail. My personal opinion is that the table does not specify enough accelerating steps for small motors. In the case of a reversing controller for either a constant speed or an adjustable speed motor, or in the case of a dynamic braking controller for an adjustable speed motor, I do not think that less than three steps should be employed for any size of motor. In the case of a reversing controller it is necessary, on reversal, to commutate the line voltage plus the counter electromotive force, which sum is substantially equal to twice the line voltage. In the case of a dynamic braking controller for an adjustable speed motor, if dynamic braking is secured on full field and the motor has previously been running on weak field, the controller may be called upon to commutate twice or three times the line voltage. Obviously, either of these cases present difficulties not encountered when the motor is merely started from rest.

Mr. Brooks intimates that the automatic controller is not satisfactory for lathes, stating that for many uses "the drum controller has been found to fill the requirements quite satisfactorily". I disagree with both of these statements. I believe that there are more automatic controllers on lathes than on all other machine tools combined. Several of the fastest working machine shops in this country are using several hundred of such controllers. As long ago as 1913, the R. K. LeBlonde Machine Tool Co. wrote a letter containing this statement:

"From recent tests made in our shop on one of our heavy duty lathes, equipped with your controlling devices, we find that we are able to produce 20 per cent more work than can be done on an ordinary motor-driven lathe. These results are directly due to the automatic stopping, starting and drift positions and the dynamic braking obtained by the use of your controlling devices."

Old Drum Controller Undesirable

I think the old style drum controller for lathes is unsatisfactory and I would first refer to that portion of Mr. Brooks' paper in which he describes the discomfort of hand acceleration on a drum type starter, and to his assertion that arrangements should be such as to prevent a "pump back" when stopping the motor. I would also refer to a recent technical paper by D. M. Petty, electrical engineer of the Bethlehem Steel Co., in which are described "comparative tests made on duplicate engine lathes doing the same work and driven by duplicate controllers, the difference being an automatic controller in one case and a drum type controller in the other". This paper declares that "the stopping time with the automatic controller using dynamic braking in the off point, was 8 seconds as against 40 seconds with the drum type controller". Mr. Petty reaches the following conclusions:

"*First.*—The automatic controller protects the motor, not only from excessive currents in starting, but from excessive voltages in stopping.

"*Second.*—It decreases the starting and stopping time, which amounts to a considerable item when the operation requires frequent stopping.

"The possible exceptions to this conclusion would be that a drum type

controller might equal the automatic on applications using speed adjustments of one to 1½ or under."

To Mr. Petty's conclusions I would add the following points: First, the drum type controller has the damaging "pump back" characteristic which Mr. Brooks condemns, and, second, with the drum type controller it is necessary to hunt for the desired speed each time the motor is stopped and started, whereas with an automatic controller this best cutting speed is maintained regardless of stopping and starting until it is purposely changed to suit the changing requirements of new work. The only advantage occurring to me which the drum controller enjoys over the automatic controller as applied to lathes is that it requires but one spline shaft for apron control, whereas two are required for automatic control on very long bed lathes.

Under the subject of car wheel lathes it is stated that the controlling panel should include, in addition to accelerating contactors, two dynamic braking contactors. Why not use the same contactors for acceleration and dynamic braking, as this is easily accomplished? Mr. Brooks also says that a reversing planer controller should incorporate dynamic braking. It is my belief that the planer motor should be reversed by the reverse power method instead of being first stopped by dynamic braking and then reversed. The object is to reverse the motor in the quickest safe time. The quickest reversal is accomplished by having field strength at its maximum armature current of the highest safe value, and a minimum number of movements of magnetically operated switches. To first stop the motor by dynamic braking, means that dynamic braking switches must close and open, and in addition the reversing switches must function.

Standardization and Finality

Mr. Brooks recommends drafting specifications for at least a partial standardization of automatic machine tool controllers. Standardization is always a pleasant thought to conjure with, and is excellent if not accompanied by too many disadvantages. Standardization is proper when, in any sphere of activity, there is complete unanimity of opinion as to the best methods and best equipment. It is profitable to standardize a method or a machine only when that method or machine obviously represents practically the last step in its evolution of design.

I am sorry that Mr. Brooks felt compelled in closing his paper to intimate that it is necessary to buy the motor and the controller from the same company. He bases his argument on the statement that if the controller engineer knows the motor well enough the controller can be made to include less equipment. By inference this controller would not work as well with some other motor. In these days of standardized motors, the controller should be good enough to work with any standard motor. All competent control engineers understand the characteristics of the motors to which their controllers are applied. What is more needed is for the control engineer to get out in the field and study the work from the standpoint of the ultimate user. In general, an appreciation of operating requirements is much more needed than an increased understanding of motor characteristics.

Iron Ore in Lapland

The theory that Finnish Lapland contains vast deposits of the highest-grade iron ore, equal, if not superior, to the vast deposits of Swedish and Norwegian Lapland, has been confirmed by exploratory work carried on by individual owners in the region lying between 67 and 68 degrees N. latitude and 25 degrees 30 minutes and 27 degrees 30 minutes E. longitude, within which area four vast deposits are exposed.

This great area is the center of the magnetite and hematite ore zone traversing these regions of the north, the ore deposits being of a sedimentary origin. The specific gravity at the surface varies between 4.6 and 5.18, improvement upon which is bound to occur as the deposits are opened. The grade is 75 to 85 per cent of metallic iron. Should the ore within this known area be of a depth of 300 meters (984 feet), the known depth of the mines in Swedish Lapland, which may be defined as the fringe, or marginal deposits, of the great ore zone, the site of Sukuvaara alone would represent 1,000 by 2,000 by 300 meters, or 600,000,000 cubic meters (785,000,000 cubic yards) of high-grade iron ore. It is contended, however, that this great center of the ore zone has a depth of 1,000 meters (3,281 feet), and the site of Sukuvaara is only a small part of the Finnish ore area.

The construction of a railway to make these deposits available is under consideration by Finnish capitalists. From the port of Kemi, on the Gulf of Bothnia, there is a railway line to the village Rovaniemi, where the rivers Ounasjoki and Kemielf meet. The length of this line is 71 miles. From Rovaniemi to the site Sukuvaara, in the parish of Sodankyla, the distance is 87 miles. The first point necessary would, therefore, seem to be to get Sukuvaara connected by rail with Kemi. This work would, however, have to be considered as only preliminary, Kemi not being an open port all the year round. A railway from Rovaniemi to Sodankyla must be built, however, as it will be the only way to transport to Sukuvaara the machinery and tools necessary for an extensive iron-mining industry. Besides this, it is possible that the Finnish government would not sanction the building of a railway line to the north of Sukuvaara, if this line is not connected with the other railway lines of the country.

The line from Rovaniemi to Sukuvaara being completed, a continuation will have to be built through Matarakoski and the site Kongas, along the western and northern borders of Lake Enare, to the mouth of the Neida river in Varangerfjord, at the Arctic Ocean.

Only in this way Finland can have an open port for exporting ore all the year round. The distance from Sukuvaara to Neida is 193 miles. From the Finnish border to the port in Norway is a distance of 11 miles; for this part of the line it will be necessary to get the co-operation of the Norwegian government.

The length of the Lapland railway line in Finland, from Rovaniemi to the Norwegian border, would be about 268 miles of main line, or, including switch lines, about 280 miles.

The cost for building railway lines in Finland has averaged 100,000 Finnish marks per kilometer (about $31,000 per mile). The proposed line would, perhaps, be somewhat dearer, as heavier rolling stock than is generally in use would have to be arranged for, to transport the ore; for this purpose cars for a load of as much as 30 tons would be preferable.

The ore would be transported principally along the line Sukuvaara-Neidaelf—about 183 miles in Finland. The Finnish tariff gives the freight for iron ore for this distance at $1.45 per ton.

If iron girders, rails, and ordinary bar iron are manufactured, for Finland's own use, it would be absolutely necessary to import coal. In this case, coal from Spitzbergen would be decidedly cheaper than coal from England, for the distance from Spitzbergen to Varangerfjord is only two-fifths of the distance from England to the same port.

The name of the American Car & Ship Hardware Mfg. Co., New Castle, Pa., recently was changed to Johnson Bronze Co. The company announces that its plant is being enlarged and that this change in name has been made for the convenience of the trade and will not interfere with the policy or personnel of the business.

Malleable Iron—Its Uses and Abuses

IN THIS INSTALLMENT of his interesting paper, Mr. Touceda suggests means of bringing about a better understanding between the engineer and manufacturer, tells of important changes in business policy recently adopted by many manufacturers, and discusses the abuses of malleable iron castings

BY ENRIQUE TOUCEDA

THE ability of a metal to withstand abuse under shock is a matter that can be discussed only in a very unsatisfactory manner, as many things in connection with this characteristic of a metal, in the light of our present knowledge, cannot be made plain.

Under tensile test I have seen test bars yield results so good, that one lacking experience might be led to conclude that the metal would stand a shock test equally well, but from a rather lengthy experience I am convinced that no test except a shock test will disclose how a metal is going to act under sudden impact.

Conclusions that are in any way trustworthy cannot be drawn from tensile tests, no matter how complete. The nature of the matter in the bond or cement that binds the crystalline grains together is certainly different from the material that constitutes the metallic grain itself. This dissimilarity is much greater than is implied in the seemingly accepted fact that the main difference between the two is that the grain is crystalline and the cement non-crystalline, for while this might be the entire story in the case of absolutely pure metals, I do not believe it to hold good when we consider commercial products.

One thing we do know is that at times this bond or cement is much weaker than the matter of which the grain is composed and at other times it is the stronger of the two. I am inclined to think that in the former case the casting will be weak to shock and in the latter it will be shock resistant, under the assumption, of course, that the grain size and composition are the same in each case, and the composition not such as to invite failure.

The question may now seem pertinent as to why malleable iron, in view of the large percentage of impurity contained in the metal, is able to withstand such punishment as the castings receive in service, or as shown by test bars tested dynamically. The test wedge previously mentioned stood over 50 blows of 70 foot pounds before failure took place by fracture and in some plants this is no particular exception. In Figs. 9 and 10 are shown some large automobile castings that have been sledged violently and through a comparison of the distorted one with its mate, you can readily see how these have been bent and twisted almost without the start of a fracture.

We all know that as the combined carbon in steel increases, its ductility lessens, and we also know that combined carbon exaggerates the evil effects of phosphorus. You have been told that the structural composition of malleable iron consists of a mass made up of grains of iron containing no combined carbon in them, throughout which structure is uniformly distributed small nodules of free carbon.

While these grains contain no combined carbon, they do, of course, contain the impurities that are in the iron other than carbon. However, these impurities we know can be present in large amount without imparting brittleness and without affecting the ductility of the grains, presumably due to the fact that the grains contain no combined carbon.

In a paper read at the convention of the American Foundrymen's Association, last fall, on the matter of phosphorus in malleable iron, I showed photographs of wedges that had stood as high as 40 blows of 70 foot-pounds before failure took place, and in which the phosphorus content was close to 0.40 per cent. As the phosphorus increases beyond about 0.250 per cent it begins to alter the character of the fracture, giving it a more or less crystalline appearance. No such percentage is recommended, of course, but there has been a great deal said in connection with the harmful effects of this element and it occurred to me to point out the facts given above. It will be acknowledged that any metal that will stand 40 blows of 70 foot-pounds on sections whose maximum, where the wedges broke, were considerably less than one-half of a square inch, is very superior. Provided the manganese and sulphur are properly proportioned, very superior metal can be obtained with the sulphur as high as 0.13 per cent.

I believe it will be conceded that, in commercial castings, those resist rust better that are the lowest in combined carbon and manganese. In malleable iron combined carbon is practically absent, while the manganese should be comparatively low. I have no positive data to offer in this connection but I believe that railway men in general consider that malleable iron tie plates, rail anchors, etc., rust less rapidly than do similar castings when made of other ferrous material.

The cost of melting malleable iron is greater, as it is more expensive to melt in an air furnace than in a cupola. Maintenance cost is higher also. When the cupola is tapped and the metal run in the molds, the castings are not subsequently heat-treated; but when the air furnace is tapped, only the first step in the malleable iron process has been completed, and the castings must be heat treated for an interval of eight days. So they have this extra fuel account, and a large labor cost in addition, as the castings have to be packed in pots and then removed from them.

In connection with malleable iron as a material for use in machines or for structures, one often hears the following statements: — "When the skin has been removed the rest of the section is practically useless," "The structure is not uniform throughout any given section," "Castings cannot be properly annealed when the sections exceed ½-inch in thickness," etc. Let us take up these statements and see if there is any foundation in support of them. All who have had any experience in the examination of metals by aid of the microscope and have had the advantages of even an elementary schooling in its use, know that when any iron or steel product has been heated

Second and final installment of a paper presented before the Railway Club of Pittsburgh, Feb. 25.

for a period of time in contact with the oxidizing atmosphere present in the ordinary heating furnace, they can count upon seeing a border around the surface of the casting that will be either entirely free from carbon, or contain very much less than the part enclosed within this border. The border referred to is commonly called the "skin" irrespective of whether the material be cast or rolled or forged, although as I will subsequently point out, a distinction should be made between cast and worked material.

In the case of malleable iron, the skin in the majority of cases is exactly similar to the skin that is on the soft steel casting after it has been annealed, there being in typical cases no distinction whatsoever. As a matter of fact, no ferrous product can be heated in contact with the atmosphere present in the ordinary heating furnace without its having a decarbonized skin, and in this particular malleable iron is no exception. In a paper written for the American Foundrymen's Association, I entered into a discussion of a comparison between the strength of metal in skin and core. It was demonstrated that in the case of a bar whose ultimate strength would run 41,000 pounds per square inch, if the strength was mainly in the skin, the metal in this skin would have to stand about 100,000 pounds per square inch to enable the bar as a whole to register 41,000 pounds. As a matter of fact, a great deal of malleable made for railroad work will average as high as 48,000 pounds per square inch, in which event the metal in the skin would be required to stand over 115,000 pounds per square inch to bring the bar as a whole up to the former figure. What can be said when the ultimate strength runs up to 55,000 pounds as not infrequently happens, this being the goal towards which the malleable manufacturer is at the present time aiming?

In connection with rolled steel, it is, I believe, conceded that the strength of the steel with the skin removed is not as strong as when tested with the skin on, but I would point out that in this case there are certain things to consider that do not obtain with cast materials.

When metal is worked, as in rolling, the influence of the work on the surface of the piece is much more effective than towards the interior, which makes for greater strength and tenacity. In addition, investigation will disclose that the crystals in the metal of the skin are smaller than those further in towards the center, this condition adding to the strength and tenacity of the skin. Thus it is to be expected that the skin of rolled material is stronger than the metal that it encloses, but such is not the case with good malleable iron, at least to any appreciable extent. Poor and badly annealed malleable iron often does have a skin, which may be both bad in quality and better than the interior. Also, if improperly designed and gated test bars are used for experiment, it is to be expected that the unsound material that forms a large part of the interior will not show up to advantage. In the paper referred to, a record is given of results of tests conducted on bars properly made for this test, and these tests do not show that the skin adds materially to the strength of the bar.

There is just one way to ascertain the truth or falsity of the statement that the structure of a malleable casting is not uniform throughout any given section, and that is through the aid of the microscope, though theoretical considerations alone should indicate that there can be no foundation for this belief. The structure of white iron is uniform no matter how thick the section. To anneal white iron, that is, convert it into malleable iron, all that is necessary is to heat the iron up to a temperature of about 1,450 degrees Fahr., hold it at that temperature for 60 or more hours and allow it to cool very slowly for about three days. The structure of the white iron consists of the two constituents, cementite and pearlite, and annealing in this case simply means the breaking up of the hard carbide into soft iron and free carbon, by means of heat. I have stated that to anneal, all that is necessary is to heat to about 1,450 degrees Fahr., and hold at that temperature for a certain length of time. If this is all that is required, *and it is all*, then the only question involved as to the possibility of annealing any given section uniformly throughout, lies in one's ability to heat the section uniformly throughout. Since pieces of other materials, frequently having sections a foot thick, are being continually heated uniformly throughout their bulk, it is difficult to understand why malleable iron should form an exception to the rule. If then, any thickness of malleable iron can be heated uniformly throughout, it can be uniformly annealed, because the structure of the white iron is uniform throughout to start with and as the breaking up takes place *in situ* the resultant structure must be uniform. However, to make a practical illustration, I requested a friend to cast a piece of white iron 2 inches in diameter and 6 inches long and to anneal it in exact accordance with his usual practice. This was done. After the receipt of the piece, a section was cut from

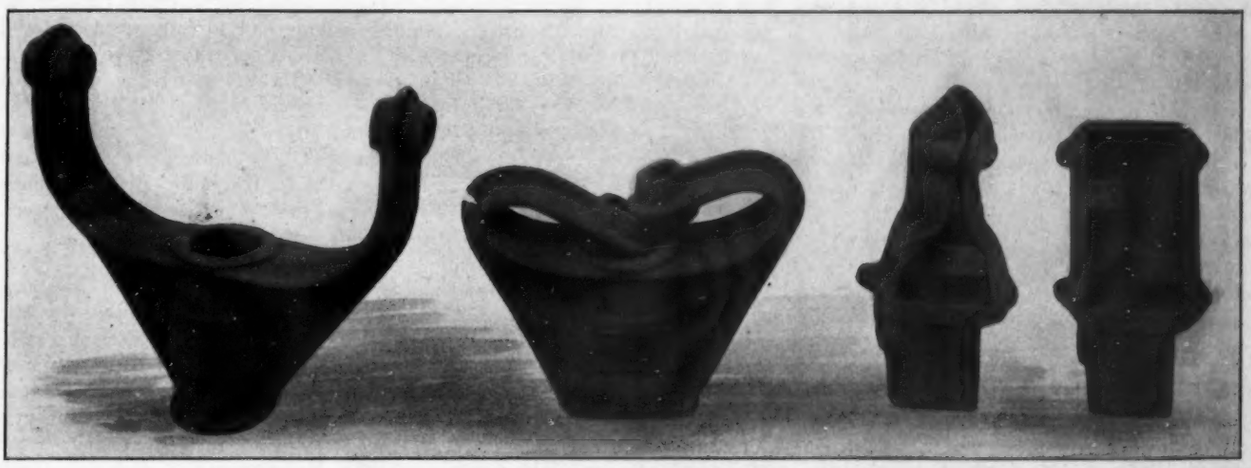


FIG. 9—LARGE AUTOMOBILE CASTINGS BEFORE AND AFTER BEING VIOLENTLY DISTORTED

it, polished and etched, and examined under the glass. With the exception of the narrow decarbonized border, the section is perfectly uniform throughout, and if the observer were uniformed as to the spot he was examining under the glass, he would be unable to designate, except by guess, whether he was looking at the center or at a spot near the surface.

The above explanation should serve also to clear up the false impression that when sections exceed 5/8-inch in thickness they cannot be properly annealed. It is true that during the annealing process, while the hard carbide is being broken up into soft iron and free carbon, some of the carbon is being removed through the oxidizing influence of the packing which surrounds the castings. It is also true, for obvious reasons, that more carbon will be removed from a very thin section than from a much thicker one, but the structure of the thin section will be uniform throughout and so also will be the structure of the thick section, though the latter will contain more total carbon. The difference in the amount of carbon removed between a piece as thin as 1/16-inch and ½-inch would be very considerable, but the difference in the case of a piece ¼-inch and 1½-inch thick, would be inconsequental.

Suggestions for Mutual Benefit

We are all familiar with the pattern that causes infinite trouble due to faulty design; the one that through proper changes here and there, can be made to yield stronger castings. These may be made even lighter in weight than when cast from the original pattern, if only the designing engineer would listen to the voice from the foundry and permit it to be altered to accommodate the peculiarities of the metal for which it is to be used.

Failure to permit this has caused the industry great harm in the past, due to the impossibility in many cases of securing castings free from weak spots caused by shrinkage. The metal may be of splendid quality as shown by tests made on strips cut from different parts of the castings, but the pattern may be designed so that one part would have a tendency to pull away from or feed another while solidification was taking place, resulting in a casting which, taken as a whole, could not be strong. This lack of strength would result from no fault of the manufacturer who had accomplished the best possible with the pattern furnished him. Such castings naturally have a shorter life than should be the case. They not only discredit the metal in the eyes of all whose attention has been attracted towards them, but based upon the poor results obtained through their use, it is at once decided by the management that in the future, castings for this structural detail shall be made of some other material. In making this change, the pattern must be altered, and if better attention is given to the pattern construction, success ordinarily follows, not only by removing the essential defects of the pattern but by thickening the sections when it is necessary to accommodate a more sluggish metal. While attention is called to this problem of correct pattern design, conditions have continually improved and in a great many instances the engineer consults with the patternmaker before putting the finishing touches to his work. It will take a long time, however, to remove the ill effects of this one factor in bringing the malleable casting into disrepute in the minds of many who have not had the time or opportunity to investigate for themselves. I believe a very interesting monograph could be written, showing through proper illustrations, what this failure to co-operate has meant in the past to both parties, and what it means now, as against the more progressive and up-to-date plan of mutual assistance.

Some 40 years ago, owing to the rapid development of the west, and the natural growth of the country in the east as well, there was an ever-increasing demand for the gray iron and malleable iron casting, for use chiefly in connection with the railway and agricultural implement business. While the cost of a properly equipped foundry of any kind runs into considerable money, it is possible to start in a very modest way, and particularly was this the case 40 years ago. The demand for the product was great and the profits were large. From the quickly accrued gains, a very modest installation was soon converted into a much more pretentious one. However, very little attention, except in a few instances, was given to a systematic attempt to improve the process by taking advantage of the advances in metallurgical knowledge in general. Strict attention was invariably concentrated on anything that might tend to cheapen or increase the tonnage. The manufacturer at that time was secretive. Scientific investigation, he believed, might improve his product, but since he was selling all the castings he could make, and was doing a splendid business, it seemed clear to him that to throw open his plant to the investigator would make the manufacturing details known. In this manner, competition would be invited, and in the end he would lose more through this procedure than through lack of progressiveness.

This reasoning was correct up to a certain point, but such a policy eventually leads to trouble. Cars, agricultural implements and machines had to be cheapened; castings to meet these conditions had to be lightened, and the product was continually being measured by higher and higher standards. Castings that would have been accepted previously were rejected. Through his shortcomings, the founder who, by reason of his inferior work, had to be continually looking for new customers, or always apologizing for his product, caused almost irreparable injury to those who had already seen a light. The number of those who saw the necessity of improving the quality of their product grew steadily. It was difficult, however, to shake off and neutralize the bad impression that existed, and still exists, in the minds of some of the users and purchasers.

Organize for Progress

Realizing the false position in which the industry has been placed by the manufacturer who is not progressive and who consequently cannot make good castings; by the harm that has resulted and still results through the attempt to furnish castings from badly designed patterns; by the lack of information possessed by the average engineer in connection with this product; by the lack of any reliable literature, on the manufacture of malleable iron, aside from a few fragmentary articles and papers; realizing these conditions, it was decided about three years ago by a number of manufacturers of these castings, to join issue for the common good and, through co-operation, spend any amount necessary to ascertain in what direction the product could be improved, particularly in quality; to standardize methods of testing and inspection, and to have their works periodically visited by highly specialized metallurgical engineers whose duty it would be to pick any flaw in product or process, inspection or test.

How this important change in business policy has been undertaken and what has been accomplished will now be very briefly described.

The work first undertaken was a complete study and investigation of

the metallurgy of the process in an effort to ascertain the interdependent relationship between the different elements in the iron, as affecting both the air furnace work and the annealing. The changes that occurred during the annealing process were then investigated through a systematic study of many samples from many plants. As it was fully demonstrated by the bureau that the results of a tensile test were in no sense a measure of what the metal might stand under shock, and as malleable iron castings are subjected to dynamic stresses when in service, it was decided to design a testing machine and adopt a test bar for this purpose, which would show just what might be expected from the metal when subjected to shock. At the present time, all companies included in this group of manufacturers, are making daily tensile and dynamic tests from test bars that are identical in shape, and on testing machines of the same design.

It was then decided that all testing records would be uniformly kept. A chart was printed on cross-section paper on which a curve could be drawn that would represent the test results of the product from each heat for each day of the month. Thus it is now possible for any manufacturer to compare what he is doing as regards quality, with any or all of his fellow members. At the end of the month, an average of the results of the physical tests for that month is computed, and these figures sent to the bureau. Similar figures from all the members then form data by which a curve can be plotted which shows what the membership as a whole is doing. These monthly curves are compared at each monthly meeting to see if there is an improvement in the product of the association as a whole. This procedure also is a means of measuring the benefit being derived from the work of the bureau. All members are required to send daily test bars to the bureau as a check on their own tests.

Secure Data on Problems

When any member meets with difficulty, the bureau engineer visits the plant. If the trouble is new and might prove of general interest to the membership, a full report is made, so that each member will receive the benefit of that particular investigation. Little by little a vast fund of information has been accumulated concerning the metallurgy of the process. This has not only served to do away with nearly all irregularity of product from day to day, but has placed the manufacturer in a position to guarantee his product as being uniform and dependable.

You are interested particularly in castings used in car equipment and tracks; such castings as column posts, brake beam struts, cheek plates, push pole pockets, striking plates, coupler carriers, back stops, side bearings, sheave wheels, tie plates, rail anchors and a multitudinous lot of others.

Causes of Faults

The use of these castings is wide and varied. In regard to the abuse that has been laid not too lightly on such castings, there are certain facts on which I would like to dwell. First and foremost, it is acknowledged that no one is more responsible for their abuse, all along the line, than the malleable iron manufacturer himself, for which short-sightedness he has had to pay most dearly. For many years he was indifferent as to quality, if indifference can be measured by failures to abandon rule-of-thumb methods. The material was not dependable and abuse followed, because not only was he unacquainted in large measure with the metallurgy of the process, but he did not realize the importance of annealing furnace control; temperatures were estimated solely by the eye and no provision was made for ascertaining the temperature at different parts of the oven.

Again, the integrity of the casting as a whole was not given the attention the matter deserved, and shrinks were driven to less harmful localities, rather than removed altogether. From this cause failure resulted, often when the metal was actually superior as shown by test strips cut from solid portions of the castings; troubles which could have been avoided had the manufacturer known then what he knows today.

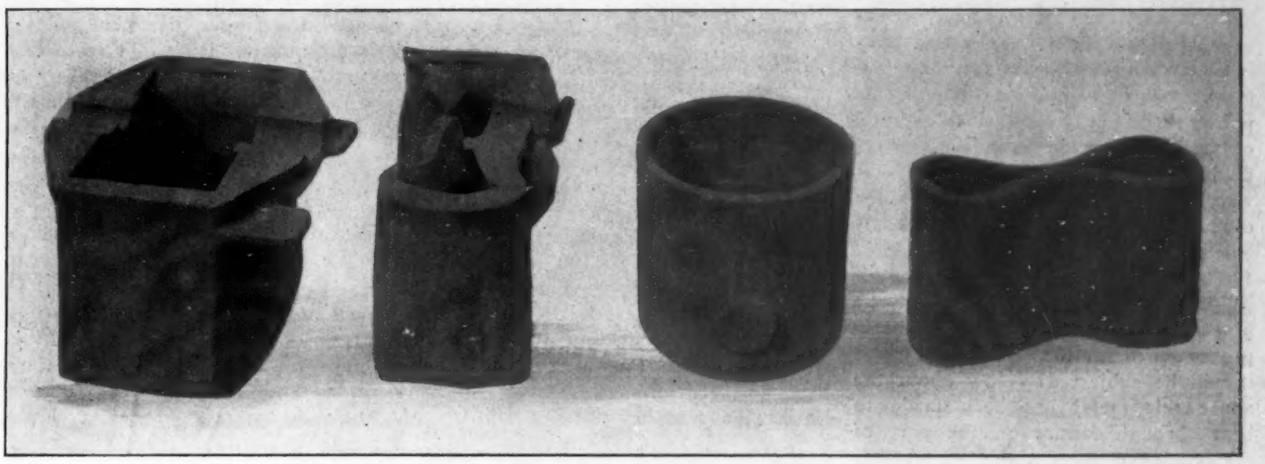


FIG. 10—ANOTHER GROUP OF AUTOMOBILE CASTINGS SHOWING FREEDOM FROM FRACTURE AFTER VIOLENT DISTORTION

I feel no hesitancy in stating that such conditions as described no longer exist in the manufacturing plants of the organizations which I have mentioned. But if these conditions have since been forgotten by the manufacturer, the recollection seems to linger with some engineers, and to prejudice their attitude towards malleable iron.

Today, the manufacturer knows positively the best mixture. The reactions that take place in the air furnace are familiar to him and these furnaces are run with intelligence. Annealing oven temperatures are all gaged, no longer by eye, but by recording instruments attached to a pyrometer equipment. Thermocouples are permanently inserted in several places in the ovens, and, in addition, openings are available for

the introduction of elements at intermediate localities as a check to insure uniformity in all parts. At any moment, the superintendent has it in his power, through the turning of a switch, to ascertain the temperature in any oven under fire. When a new casting is to be made, a scientific study of the gating and proper height of head, necessary to produce absolute freedom from shrinkage, is undertaken. Trial white iron castings are made simply for the purpose of breaking them up into small pieces in order to see if a shrink has formed at any part. These tests are continued until all shrinkage signs have disappeared and the casting is equally solid throughout. These plants have their own inspectors, and when, through inadvertence, a heat does not measure up with the high standards adopted, these men have authority to scrap the castings and prevent shipment.

Now as to the part the engineer has played in the abuse of these castings. What can be said of the engineer who designs a push pole pocket with only a ⅛-inch section of metal? Can a similar casting made of any metal stand up in service, and should malleable iron be censured when it fails under such circumstances? Does any reader doubt for a moment but that a malleable iron push pocket would be practically indestructible if properly proportioned for the stresses to which it will be subjected? How about the abuse this metal has been made to bear through failure on the part of the engineer to design the casting properly? I believe that neglect to design malleable iron parts properly is responsible for 80 per cent of the failures. If the patternmaker at the foundry were consulted, he could demonstrate very quickly his ability to alter such patterns and frequently lighten the casting and add to its strength. I would point out, in this connection, that when the engineer attempts to cheapen the casting by making it lighter, he as a rule defeats the ultimate aim. Through his method, more cores must often be used. While there may be less metal in the casting, the cost for molding is increased and consequently a higher price per pound must be asked.

Gaston, Wigmore & Williams, New York City, who have been large purchasers of iron and steel products for various foreign countries during the past year or more, have incorporated in Delaware, the Gaston, Wigmore & Williams Steamship Co. of New York, with a capital of $5,000,000.

New Process

Of Refining Nickel Promises Very Important Developments.

Ottawa, Ont., March 6.—In the course of the debate on nickel question in the house of commons, W. F. McLean, M. P., referred to a new process of nickel refining which has been discovered in Canada, by which 100 pounds of ore can be converted into 50 pounds of metal in 48 hours. Prof. L. P. Burrows is the inventor of this new process, which seems likely to revolutionize the nickel industry. The new process is also applicable to the treatment of other ores. The new discovery is of especial interest to the people of Ottawa, inasmuch as the experiments have all been conducted there and have been financed by Ottawa capitalists. Associated with Prof. Burrows in the proposition are a number of Ottawa men, including A. W. Fraser, J. W. Hennessy and E. Seybold, as well as prominent Toronto and Sudbury capitalists. A parent company has been incorporated under the name of the Burrows Refining Co., with head office at Ottawa, Ont., and $1,500,000 capital stock; but another company which will undertake the actual work of refining will be incorporated shortly capitalized at $5,000,000. The company will begin operations at once, and, unless unforeseen delays occur they will be producing nickel alloy within three or four months. They have acquired extensive nickel deposits in the Sudbury district and the estimate of their engineers is that sufficient nickel is now in sight to keep their plant busy for 15 years. The nickel deposits will be developed first, but later on the immensely valuable deposits of iron up the Gatineau and in the Laurentians will be developed.

By Professor Burrows' method there is no preliminary roasting. The ore when mined is crushed and placed in the refining apparatus, where it is subjected to a gaseous treatment for about five hours, after this it is smelted and refined to the finished alloy in the form of a very fine powder, being a very superior article for alloying steel. This powder equals about 75 per cent of the ore. If desired, the powder can be reduced to the metallic form, producing abofit 50 per cent in weight of the ore, entirely free from sulphur and eminently suitable as a high grade metal for many purposes as well as alloying steel. The steel produced by this alloy has proven to be better than steel produced by a higher percentage of alloy as done by the old method. Professor Burrows has demonstrated that the immense iron deposits of the Laurentian range can be satisfactorily treated and it will result in the building up of enormous industries in the production of steel and particularly the world's supply of nickel steel. Up to the present, these large deposits of iron ore in Canada have not been utilized owing to the sulphur and other contents of these ores. Although Canada practically possesses a monopoly of the supply of nickel ore, the country has not benefitted, as it has gone abroad to be refined and used in connection with the iron ores of other countries.

Describes Youngstown Hospital

Hospital Management, published at Louisville, Ky., has made its appearance, a feature being a department for industrial hospitals. It is announced that this department will be a permanent and important feature of the publication, the idea being to record developments in the rapidly growing field of welfare work. The leading article in *Hospital Management* for February describes the hospital of the Youngstown Sheet & Tube Co., which was recently opened with Dr. Sidney McCurdy in charge.

Meet in South.—The next convention of the American Hardware Manufacturers' Association will be held with the Southern Hardware Jobbers' Association at the Tutwiler hotel, Birmingham, Ala., April 18 to 21. The Tutwiler is a fine, modern hotel and ample accommodations are assured members.

The National company, which was recently organized by E. E. Kramer, and associates, of Pittsburgh, is erecting a modern plant at New Cumberland. The main foundry building will be 60 x 340 feet and a lean-to will be 30 x 340 feet. The main building will be commanded by a 40-ton crane. One 15-ton acid open hearth furnace and an electric furnace will be installed. The company will be equipped to manufacture castings up to 20,000 pounds.

The Glasgow Iron Co., manufacturer of iron and steel plates, Pottstown, Pa., advises that the plate mill which it recently leased to L. F. Nagle, will not affect the Glasgow company's business in manufacturing steel plates for fire box, flange and other grades. The Nagle Steel Co., organized by Mr. Nagle, is distinct from the Glasgow Iron Co.

Iron and Money: Fact and Comment

Lackawanna Steel Co. Makes Excellent Showing—Wall Street Has Another Blue Week

THE Lackawanna Steel Co. makes an excellent showing for the last calendar year in its annual report, the net profits being $2,409,108 for 1915, despite a deficit of over $600,000 in the first four months of the year. The income account compares as follows:

	1915	1914
Gross sales and earn..	$27,792,935	$16,281,639
Mfg. cost & oper ex.	21,061,731	14,057,189
Inc. for mfg. & oper.	6,731,204	2,224,450
Other income	344,622	338,489
Total inc.	$ 7,075,826	$ 2,562,939
Gen. exp, tax, disc, etc.	1,098,357	981,560
Net earnings	$ 5,977,470	$ 1,581,378
Int, rent and rylts..	2,044,720	2,167,186
Surplus	$ 3,932,750	*$585,808
Skg fd, dep & renew	$ 1,523,642	$ 1,066,637
†Spec. prof.	.....	.....
Surplus	‡$2,409,108	*$1,652,445
Dividends	88	350
Surplus	$ 2,409,020	*$1,652,795
Prev. surplus	5,777,457	7,514,876
§Spec. approp.	104,205	.....
Fire loss	.....	84,625
P & L surplus.....	$ 8,082,272	$ 5,777,457

*Deficit.

†Special profit from sale of capital assets of subsidiary companies.

‡Equal to 6.93 per cent earned on $34,750,000 stock against deficit previous year.

§Appropriation for net balance of discount and commission on gold notes issued less discount on gold debentures redeemed.

Shipments increased about 55 per cent over 1914. The average price per gross ton of $30.75 received therefor was $2.67 more than in 1914, a gain of 9½ per cent. Following is a comparison of total shipments for the past 10 years in gross tons, and the average price per ton received for the products:

	Gross tons.	Av. price.
1915	903,832	$30.75
1914	579,742	28.08
1913	984,921	30.34
1912	983,546	27.72
1911	760,363	27.67
1910	1,082,515	28.92
1909	913,615	27.67
1908	476,850	31.63
1907	991,700	33.28
1906	969,047	.....

President E. A. S. Clarke, in his remarks to stockholders, says in part:

"The results of the year 1915 have fully justified the forecast of a year ago that orders would continue to increase, as well as the hope then expressed that the year 1915 would show improvement over 1914. By the end of March the demand for steel for export had become considerable and your company secured large orders at profitable prices. The volume of domestic business gradually increased during the first half of the year, with moderate increase in prices; and the last half showed a gain in volume of orders and prices for both domestic and export business that enabled your works, especially during the last quarter, to run at maximum capacity and large profits, the year closing with the greatest volume of orders on hand and at the highest prices in your company's history."

Great Possibilities

E. C. Porter, who for the past two years has been the commercial agent in charge of the Bureau of Foreign and Domestic Commerce, has resigned to become executive secretary of the recently-organized Russian-American Chamber of Commerce. Speaking of the tremendous possibilitiees for American manufacturers in Russia, Mr. Porter says:

"Few American manufacturers realize the potential possibilities of the Russian market. Russia today, with its population of 170,000,000, with the great undeveloped resources, furnishes one of the most important and probably the most likely market for American goods. Previous to this time the United States has had a very small share in the trade with Russia, and a large part of the trade between Russia and the United States has been handled through German houses. In 1915 the total imports into Russia were over $707,000,000. Of this amount the direct import of manufactured commodities from the United States to Russia was only 5.8 per cent, and the United States has had a relatively small trade in the purchase of Russian raw materials direct, although Russian raw materials are the basis for many important manufactuirng industries in this country."

C. M. Woolley, president of the American Radiator Co., in his statement to the stockholders in connection with the annual report, states the foreign business of the company had been seriously affected by the war, resulting in a large curtailment of the sales. No dividends have been declared by any of the foreign companies since their establishment, all the profits being utilized for their development. For this reason, their income has not been included in the balance sheets of the company.

Industrial Stocks

The past week again illustrated the fact that developments in Wall street very often do not reflect correctly conditions in the industrial world. In spite of the continuance of great business prosperity, Wall street continued in the dumps and nearly all industrial stocks recorded a net loss of the week. In the absence of anything in home affairs to justify the downward trend of stock prices, one is compelled to attribute the pessimism to developments connected with the European war, particularly the controversy between the President and some members of congress as to whether the rights of American citizens as fixed by international law should be rigidly maintained.

Developments of the week in domestic news were not numerous or important, but included some gratifying reports of increased earnings by the railroads.

Quotations at the close of business March 4 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Mar. 4.	Net chg.
American Can	58⅝	—2⅞
American Can, prfd.....	111	— ¼
Amer. Car & Fdy.....	66½	—1½
Amer. Car & Fdy., prfd....	118⅛	+ ⅛
American Locomotive	69½	+ ½
American Locomotive, prfd..	101⅞	— ⅛
American Steel Foundries...	50	—3
Baldwin Locomotive	101¼	—3¼
Baldwin Locomotive, prfd...	109	— ½
Bethlehem Steel	468	—2
Bethlehem Steel, prfd.....	130	—3
Colorado Fuel & Iron.....	41⅜	—1⅛
Continental Can	80½	.....
Crucible Steel	73¼	—3¼
Crucible Steel, prfd.....	111¾	—1¾
General Electric	167	—2¾
Internat'l Harv. of N. J....	109¼	— ¼
Inter. Harv. of N. J., prfd..	114	—3½
Lackawanna Steel	75	—2½
Nat'l Enam. & Stamp. Co...	24¼	— ¾
Pressed Steel Car.....	50¼	—4⅞
Pressed Steel Car, prfd.....	101⅞	—1⅛
Pullman Palace Car.....	162¼	— ¼
Republic Iron & Steel.....	51⅛	— ½
Republic Iron & Steel, prfd.	111	+1
U. S. Cast Iron Pipe & Fdy.	17¼	+ ⅛
United States Steel.....	81½	— ⅛
United States Steel, prfd....	116¼	— ½
Westinghouse Mfg.	62¾	—2⅛

The following table shows changes in maximum quotations of stocks not listed on the New York exchange:

	High Mar. 3.	High Feb. 25.
American Radiator	396	395
American Ship Building.....	39⅛	40
Cambria Steel	81	81
Chicago Pneumatic Tool.....	69½	72½
LaBelle Iron Works.....	50	51
Lake Superior Corpn.....	11⅝	11¾
Pennsylvania Steel	70	76
Stewart-Warner Speed Co....	86½	87¾
Warwick Iron & Steel.....	10½	10½
Westinghouse Air Brake.....	138½	139½
Westinghouse Elec. & Mfg...	65	66⅜

Business News of Nation's Capital

Tariff Will Soon Command Attention—Striking Proposal by a Democrat —Plans for Mobilizing Industries

Bureau of *The Iron Trade Review*,
206 Corcoran Bldg.,
Washington, D. C., March 7.

Administration supporters expect the house to act favorably this week on the resolution recently introduced in the lower body by Chairman Kitchin, of the ways and means committee, repealing the free sugar clause of the Underwood-Simmons tariff act. While the administration professes the reason for this action is to continue a present revenue of approximately $40,000,000 annually, Republicans are asserting that it is evidence that the administration has seen that the tariff has failed with regard to sugar. After the resolution is disposed of, the committee will take up the bill introduced by Representative Hill, Republican, of Connecticut, offering protective duties to build up the dyestuffs industry in this country, and will also act on the Redfield antidumping measure. The Hill bill probably will not be reported out favorably as it stands, but the committee may recommend that the dyestuffs industry be protected through lower duties than those suggested in the Hill bill. After these two measures are acted upon, the committee will take up the administration tariff commission bill, introduced by Representative Rainey. The Rainey bill provides for a so-called nonpartisan commission, and is opposed by some Democrats who are insisting on a board which would consist of both Democrats and Republicans, the former to be in the majority. It is believed that the administration will succeed in having the bill passed as suggested.

Unusual interest has been displayed in the bill introduced yesterday by Representative Neely, Democrat, of West Virginia, because it carries the striking proposal that the commission shall have power to establish the rates of duty in accordance with the definite standards laid down in the measure. Mr. Neely insists that the bill, as proposed, would not run counter with the constitution and says that, moreover, it would absolutely remove the tariff from politics, a thing which is generally held to be an impossibility. Mr. Neely does not think it possible to give the commission power to declare rates, but the same end is reached, nevertheless, by the power giving the commission the right to make frequent certifications to the secretary of the treasury as to any article. This process, he says, may be repeated indefinitely until the proper rate is established, the only limitation being that unless the President, on the recommendation of the commission, declares that because of unusual conditions the public interest so requires, the commission may not make a certification as to the same articles more than once in six months. The commission would have the power to reclassify the schedules of the Underwood-Simmons tariff act through certification as to any particular grade, quality or class of an article, thus changing the rate as to that, but not affecting the remaining grades, qualities and classes as to which the same conditions do not apply.

It is provided in the bill that whenever the commission finds a condition of competition of foreign industries with those of the United States as to any article whereby producers in the United States are placed at an unfair disadvantage and finds this condition is due to the existing rate of duty, the commission shall certify the fact to the secretary of the treasury. Sixty days thereafter, the rate of duty on such articles shall be 10 per cent greater than before, or, if the article is on the free list, shall be a rate of 10 per cent ad valorem. In determining the existence of this condition of unfair competition, the commission is to take into account all facts deemed pertinent by it, including the cost of production of the articles at home and abroad, with special reference to the prices paid domestic and foreign labor, the prices paid for raw materials entering into manufactured articles, producers' prices and retail prices of commodities, and the condition of foreign and domestic markets affecting American products. The commission is also given power to lower duties by providing that whenever it finds that in the case of any article the amount imported during the preceding 12 months has been less than 5 per cent of the domestic consumption of such articles during the same period, or whenever it finds that any article is sold in a foreign country at a lower price than in the United States, it shall certify this fact to the secretary of the treasury and 60 days thereafter the rate of duty shall be 10 per cent less except when the rate of duty is less than 10 per cent ad valorem, or its equivalent, if the rate is specific, in which case the article goes on the free list. The same reduction is to take place whenever the commission finds as to any article that there exists a combination or arrangement of any kind among producers or dealers whereby the price of the article is unduly enhanced or the advantage of the producers or dealers at the expense of the consumer is unduly promoted and that such combination or trust is facilitated by the existing rate of duty.

Points on Preparedness

Washington, March 7.—Representative Tilson, of Connecticut, made an interesting address in the house last week in connection with the bill which he has introduced to provide for special tools and fixtures necessary for the immediate manufacture of arms, ammunition and equipment in time of war. These tools are held to be an extremely important item with regard to the preparedness program. The measure, which has been explained at some length in *The Iron Trade Review*, is in line with legislation recommended by the war department. Although the Tilson draft is not an administration bill, it is easily conceivable that it or one like it, will receive the support of the administration. The necessity of the government manufacturing in large quantities the jigs, gages and appliances in making rifles, field pieces and projectiles was urged by Mr. Tilson. He cited the plight the entente allies found themselves at the outbreak of war when they suffered from a shortage of munitions, a condition which would not have prevailed had the private manufacturers in their countries been equipped by the governments with these appliances ready to make munitions.

Inquiry made by Mr. Tilson of Brig. Gen. Crozier, chief of the bureau of ordnance, department of war, developed the fact that the cost of a sufficient quantity of jigs, gages and special appliances from which to

manufacture 1,000 modern military rifles each day would be approximately $275,000. A manufacturer informed Mr. Tilson that, with the appliances ready at hand, rifles could be turned out in quantities in two weeks, using the same machinery which was being used before the present war.

"In short," said Mr. Tilson, "instead of waiting a year, we might have to wait two weeks after placing the contract before the rifles were being turned out in quantities."

Mr. Tilson said the government has 700,000 of the new Springfield model of rifle and a little more than 300,000 of the old Krag, which was declared to be a most serviceable rifle, but subject to the inconvenience that it does not use the same ammunition.

"At our government arsenals at Springfield and Rock Island," he said, "we can manufacture something like 200,000 rifles a year, running eight hours a day. At this rate we could supply an army of 1,000,000 men with rifles in five years, provided we did not have to make good the wastage.

"The wastage, I should say, has proved to be at least 40 per cent, perhaps more, per year, though in some European countries it has been much greater than 40 per cent a year. Therefore, aside from the 700,000 rifles now in the hands of the army, the national guard and in reserve, if we had 1,000,000 men ready to spring to arms between sunrise and sunset as suggested by one of our distinguished citizens, there would not be rifles to spring to; and if there were no way to increase the rapidity with which rifles might be turned out, part of our 1,000,000 men would have served out a five years' enlistment before there were any rifles to place in their hands. By the plan proposed in my bill we can at a comparatively small expense place ourselves in readiness to begin turning out any desired number of rifles at a very short notice. Surely this would be an economy worth while, and one that we can effect without greatly endangering the public safety."

National Defense

Washington, March 7.—Believed to have the full approval of the administration, the house committee on military affairs yesterday reported its long-awaited national defense measure, which was preceded two days by a similar measure from the senate committee on military affairs. The preparedness program, anxiously looked forward to by the country, is therefore finally started on its way.

Particularly interesting in an industrial sense is that part of the house bill calling for so-called industrial mobilization, but it is thought that added administration legislation will be proposed in this direction, such as the equipping of private plants with gages, jigs, etc., to make war material quickly when called upon by the government.

About Fools

And Other Things, an Indignant Citizen Writes to "Pitchfork" Tillman

Washington, March 7.—No action *was taken when Senator Tillman read in the senate recently the following letter, which to be appreciated should be accompanied by no attempt at explanation or interpretation:*

103 Park Ave., New York City, February 25, 1916.

Dear Sir:

I call your attention to the fact that there should immediately be appointed a commission to sit in New York, and at other points, to hear the views of small manufacturers.

One of them was in my office today. Have been negotiating with him about a boiler for some time. But, he can't get the material and he has the only type of boiler that suits my purposes. He says the material has advanced in price from 200 to 300 per cent; that he cannot get deliveries made for nine months—and people get tired of waiting; that he might as well shut up shop till the war is over; that things are getting worse; that all the steel is going to Europe for war purposes, and that nobody can get any here, except what little is left over. He says that things are in a very rotten condition.

Somebody ought to take action on this, and investigate it. It is a most important thing. The prosperity of the country depends on the great mass of little business houses and they are simply being stifled.

Our local trade in the iron industry will be scotched and foreign trade will be worse than ever by the close of the war if this situation continues and home demands should come first. This is much more important than the question of saving the lives of fools on belligerent ships. In nine cases in ten, they ought to be killed for being fools; I have no regard for a fool, whether on land or on the sea. I think any sensible man ought to be allowed to shoot a fool on sight—as the world is too full of them anyway. Osler has never expressed his opinion on this, but I am giving you mine.

I hope you will act on the suggestion.

Yours truly,
D. F. PENINGTON.

The house bill in effect authorizes the government to commandeer private plants for the manufacture of munitions in the event of war, or, if war is imminent, and also calls for an investigation as to the relative cost of government and private manufacture of munitions and the feasibility of government manufacture. The bill has been accepted by many as being unjustifiably severe in its proposal to take over private plants—for that is actually the effect of an authorization included in the measure. It would seem that the government would under certain circumstances not want to trust private makers with the manufacture of war material, this apparently being the reason given for the provision by which private plants could be taken over. At the same time, the bill provides that the government can place orders with private manufacturers, the contracts to be both obligatory and taking precedence over all other orders.

Busy Yards

Washington, March 7. — With the American ship yards crowded with work as never before in their history, reports to the bureau of navigation show they are refusing all contracts calling for new types of vessels and confining new construction to those of types for which construction plans already have been drawn. It is asserted by the bureau that with 230 merchant vessels, having a total tonnage of 901,371 tons, building or about to be started, the United States now is being outstripped only by Great Britain, and navigation bureau officials say they see a prospect that the country may recover the position it held before the civil war, when it was the foremost nation in shipbuilding.

The amount of tonnage under construction in American yards has doubled within the last year. It has increased nearly 50 per cent since the first of December, and yards are so filled with orders that many have work that will keep them steadily employed until well into 1917. Thirty-nine ships have been completed since last July. The steamboat inspection service is trying to prevent a shortage in men to command American merchantmen and has changed regulations governing issuance of licenses. The age limit for officers has been reduced and other changes are being considered.

The bureau report also shows much larger vessels are under construction than in previous years. Of the 230 ships reported building, 16 were of more than 10,000 tons and 33 were between 7,000 and 10,000.

The new plant of the Lima Steel Casting Co., Lima, O., is now in operation and everything is working smoothly. Equipment was installed and the plant started by John Sonnenfeld, of Lima, who installed a 2-ton Whiting converter and a Whiting cupola.

News of Employers and Employes

Employers' Association of Washington Has Important Meeting —Compensation on Pacific Coast

THE recent annual meeting and dinner of the Employers' Association of Washington, which was held in Seattle, was one of the most important meetings ever held by that body. It foreshadowed the active and important part it will play in the fall campaign.

All the speakers expresed confidence in the improved business conditions and each declared in effect that this alone was a substantial reason why the employers should conduct a campaign of education to prevent their employes being led astray.

President George N. Skinner presided and besides the president the speakers were: N. C. Campbell, president of the Pacific Bridge Co., representing the Employers' Association of Oregon; J. Bruce Gibson, secretary-treasurer Sumner Iron Works, Everett, Washington, and president of the Pacific Federation of Employers'; J. C. H. Reynolds, manager of the Employers' Association of the Inland Empire, Spokane; E. G. Griggs, president of the St. Paul & Tacoma Lumber Company, Tacoma; J. J. Donovan of the Bloedel-Donovan Lumber Mills of Bellingham, Washington, and Colonel Roland H. Hartley of Everett.

President Skinner, in his address, briefly reviewed the work of the organization during the year and then turned to a discussion of legislation of vital interest to the employers. He stated that there is now pending as well as contemplated some very radical legislation that will have a tremendous influence either for good or evil for the entire state, that chief among the measures to be submitted at the fall election is an anti-proselyting law, enacted by the last legislature but suspended from operation through referendum petitions. The speaker declared: "This law is of incalculable importance to all employes and to the public generally in that it would put an end to one of the most vicious and brutal and unamerican practices known to industrial life."

Speaking of other measures he stated that the members were familiar with them and that they were of equal importance with the anti-proselyting law and should finally become laws of the state. Although the legislature passed these laws unanimously, a small organized minority of voters have been able to handcuff and prevent them from becoming operative and may be able eventually to defeat the laws by a referendum vote. The speaker urged that a strong, unrelenting fight be made to retain these laws on the statute books; announced that the battle must be fought by the association; urged that all members register and vote and that their employes, friends and families do likewise. He said that the organization is accused of trying to destroy the unions. It was not against unionism, but opposes the manipulation of this unit of industrial strength for personal gain and political purposes. Other addresses emphasized the ideas laid down by the president, also urged unity of purpose, proper presentation of facts and the absolute abolishment of indifference toward vital issues.

At the business meeting following the dinner, seven trustees were elected as follows: N. C. Jamison, Everett; N. G. Blagen, Hoquaim; R. W. Baxter, C. S. Jensen, J. C. Marmaduke, James Stirratt, F. S. Graham, Seattle. The attendance was large and the interest well sustained throughout.

Compensation in California

California, like several other states, has had a workingmen's compensation law for about two years. The law in that state provides that liability for compensation shall exist against an employer for any injury received by workmen without regard to negligence, providing the accident is not due to intoxication or wilful misconduct. Compensation is usually on a basis of 65 per cent of the wages of the workman. The measure was opposed at first by employers, as unfair and oppressive in its terms. The report of the Industrial Accident Commission for the last fiscal year indicates that a total of 6,858 employers have accepted the compensation provisions of the law. A change of sentiment is shown, as the employers realize the benefits of the system. An important decision was rendered in the case of the appeal of the Great Western Power Co. against the decision of the industrial accident commission. It was held that James Mayfield met his death as a result of wilful misconduct and the court laid down the rule: "It cannot be doubted that a workman who violates a reasonable rule made for his own protection from serious bodily injury or death is guilty of misconduct and that where the workman deliberately violates the rule, with knowledege of its existence and of the danger accompanying its violation, he is guilty of wilful misconduct."

The success of the state compensation insurance fund has been noteworthy. At the close of the first year, 1914, the fund had written $547,161.24 in net compensation insurance premiums, approximately $144,000 in excess of the writings of its nearest competitor.

The Literacy Test

Washington, March 7.—Efforts of Representative Burnett, chairman of the house committee on immigration, to pass his immigration bill carrying the literacy test are being pushed vigorously, but it is the belief of opponents to the measure that even though it passes congress it will fail of enactment. They do not think it can become a law inasmuch as it would require a two-thirds majority of congress to do this over the veto of President Wilson and it is evident that the President would again veto the measure as he did previously. Proponents of the bill have endeavored to capitalize the alleged effects of the war upon immigration to this country, but have found their attempts have made no impression worth the name. The opposition to the measure in congress continues as strong as ever.

Representative Konop, of Green Bay, Wis., who has consistently opposed the literacy test, restated his position last week in a brief address on the subject. The bill itself was not before the house, and, if it is reported out favorably by the committee, probably that will not be done for some time yet.

Mr. Konop said that every member of congress has been flooded with letters from the officers of labor organizations asking members to support the Burnett bill, but insisted that the great mass of laborers of this country never have expressed themselves upon the proposition.

"We have unskilled work to do," said Mr. Konop. "The native American and the earlier immigrant will not perform unskilled labor, and the

present day immigrant who performs unskilled labor is absolutely necessary to advance us in industry. It is a self-evident truth that no man can exercise any labor, however low it may be, without creating opportunity for the labor of other men.

Grant Shorter Hours

Perth Amboy, N. J., March 6.—The Raritan Copper Works, the largest copper refinery in the world, the American Smelting & Refining Co., the Barbour Asphalt Paving Co. and the Standard Underground Cable Co., all have granted a uniform 8-hour day, with increased pay to their employes, numbering approximately 5,000 in the aggregate. The three first-named companies, in addition to granting the uniform 8-hour day, have established a minimum wage rate of 25 cents an hour. The American Smelting & Refining Co.'s action follows an increase of 1 cent an hour in the wages of its employes, which was granted Aug. 16, 1915. The Standard Underground Cable Co., commencing yesterday, shortened the working day from 52½ to 50 hours a week, the new working schedule being 7 a. m. to 12 and 12:30 to 4:30 p. m. and 7 to 12 on Saturdays, the day workers receiving for 50 hours the same pay they heretofore have received for 52 hours. The Standard company last October reduced the working schedule from 57½ to 52½ hours a week without reducing the pay. This action on the part of the four companies was due to no pressure on the part of the workmen, since there had been no agitation for an 8-hour day in this locality.

Self Insurance

Self-insurance by employers under the workingmen's compensation act of Massachusetts is being made the subject of legislative inquiry. Representatives of the leading manufacturers in the state favor the plan which would permit employers to carry their own risks, that is, make the compensation payments themselves without participation by insurance companies.

One of the principal advocates of the plan is Attorney Frank F. Dresser, of the American Steel & Wire Co., Worcester. He says that 18 of the states which have adopted workmen's compensation permit this form of self-insurance. In fairness to large employers of labor, he said, Massachusetts should do likewise. The company which he represents is paying more today for its insurance than it ever paid in benefits to its workmen before the workmen's compensation law went into effect, he said. Previous to the present law going into effect, the company had a compensation system of its own, under which the workmen received greater benefits than under the present law, but was forced to abandon it for the state system which cost the company more and benefits the workman less. If self-insurance were allowed, he said, the workmen would again obtain the added benefits of the company's system, and the company would be able to put into accident prevention work some of the money it is now paying for insurance.

Personals

W. Frank Roberts, who has been made a vice president of the Bethlehem Steel Co. in charge of the operations of all steel works, is another example of the manner in which younger men have forged their way to the front in the responsible administration and remarkable success of the big South Bethlehem, Pa., enterprise. In his new capacity, Mr. Roberts will have charge of not only the steel plants of the Bethlehem Steel Co., but of the Pennsylvania Steel Co., recently acquired. Mr. Roberts started work at 12 years of age as an office boy for Eckley B. Coxe, of the firm of Coxe Bros. & Co., in the anthracite coal regions. During the six years he was employeed in the office and technical library of Mr. Coxe, he attended an evening school of the Mining and Mechanical Institute, which was fostered by the former. In this way, he prepared himself for entrance to Lehigh University, where he was graduated from the mechanical engineering school in 1902. While at the university, he was chosen a member and president of the honorary technical fraternity, Tau Beta Pi, and also elected a member of the honorary classical fraternity, Phi Beta Kappa. Upon his graduation, he took up a position with the Bethlehem Steel Co., as assistant in the steam department. Four months later, he became the head of the department. He continued to fill positions in the steam, mechanical and construction departments until 1907, when he was appointed master mechanic with supervision over all construction work. In 1908, he was appointed assistant general superintendent. In 1912, he was promoted to the superintendency of the Lehigh plant of the company, his title later being changed to genereal superintendent. His election as a director of the company followed in 1914.

W. FRANK ROBERTS,
Vice President, Bethlehem Steel Co.

W. W. Butler, vice presidnt of the Canada Car & Foundry Co., is in New York concluding arrangements with the Russian government for a large shell contract.

The Adrian Furnace Co., Du Bois, Pa., has announced the appointment of W. W. Kerr to the position of general sales agent of the Adrian and Punxsutawney furnaces. The appointment was effective March 1. Mr. Kerr will have headquarters in Du Bois.

J. E. Lawton, latterly chief inspector of the Panama canal and who served in an inspecting capacity on this work for a period of nine years, has resigned to accept a position as consulting engineer and sales manager for Ward & Co., manufacturers' agents, Washington, D. C.

Carl Falk has associated himself with the Davenport Machine & Foundry Co., Davenport, Ia., as sales manager of the molding machine department. He has been active in the foundry business for a number of years, although not during the past year and a half. He was associated closely with the late E. H. Mumford, a pioneer molding machine manufacturer, for several years.

John C. Neale, general manager of sales of the Worth Bros. Co. and of the Midvale Steel Co., has been made president of the American Steel Export Co., of Philadelphia, succeeding W. H. Donner. This company is engaged exclusively in the handling of iron and steel and other products for export. The Cambria Steel Co. recently acquired by the Midvale Steel & Ordnance Co., owns 58 per cent of its capital stock.

Pig Iron Production in United States, 1915

(Compiled by American Iron and Steel Institute)

PRODUCTION OF PIG IRON BY GRADES, 1900–1915.

Years	Basic.	Bessemer.	Foundry.	Malleable.	Forge.	All other.	Total. Gross tons.
1900.	1,072,376	7,979,327	3,376,445	173,413	793,092	394,589	13,789,242
1901.	1,448,850	9,596,793	3,548,718	256,532	639,454	388,007	15,878,354
1902.	2,038,590	10,393,168	3,851,276	311,458	833,093	393,722	17,821,307
1903.	2,040,726	9,989,908	4,409,023	473,781	783,016	312,798	18,009,252
1904.	2,483,104	9,098,659	3,827,229	263,529	550,836	273,676	16,497,033
1905.	4,105,179	12,407,116	4,758,038	635,236	727,817	358,994	22,992,380
1906.	5,018,674	13,840,518	4,773,011	699,701	597,420	377,867	25,307,191
1907.	5,375,219	13,231,620	5,151,209	920,290	683,167	419,856	25,781,361
1908.	4,010,144	7,216,976	3,637,622	414,957	457,164	199,155	15,936,018
1909.	8,250,225	10,557,370	5,322,415	658,048	725,624	281,789	25,795,471
1910.	9,084,608	11,245,642	5,260,447	843,123	564,157	305,590	27,303,567
1911.	8,520,020	9,409,303	4,468,940	612,533	408,841	229,910	23,649,547
1912.	11,417,886	11,664,015	5,073,873	825,643	469,183	276,337	29,726,937
1913.	12,536,693	11,590,113	5,220,343	993,736	324,407	300,860	30,966,152
1914.	9,670,687	7,859,127	4,533,254	671,771	361,651	235,754	23,332,244
1915.	13,093,214	10,523,306	4,864,348	829,921	316,214	289,210	29,916,213

TOTAL PRODUCTION OF PIG IRON ACCORDING TO FUEL USED.

Coke	219	289	101	390	12,061,808	17,473,500	29,535,308
Anthracite*	2	4	11	15	42,487	42,266	84,753
Charcoal	15	17	23	40	129,496	166,656	296,152
Total	236	310	135	445	12,233,791	17,682,422	29,916,213

* Includes mixed anthracite and coke pig iron.

PRODUCTION OF PIG IRON BY STATES, 1911–1915

States.	1911.	1912.	1913.	1914.	1915.
Mass., Conn	9,649	17,366	12,810	6,594	7,802
New York	1,562,756	1,939,231	2,187,620	1,559,864	2,104,780
New Jersey	40,663	36,876			
Pennsylvania	9,807,073	12,552,131	12,954,936	9,733,369	12,790,668
Maryland	255,816	219,546	289,959	195,594	251,548
Virginia	293,642	256.167	341,815	271,228	251,346
Georgia	1,200				
Alabama	1,712 211	1,862,681	2,057,911	1,826,929	2,049,453
West Virginia	291,472	274,360	315,731	236,393	291,040
Kentucky	95,202	68,760			
Mississippi					
Tennessee	324,648	338,238	280,541	216,738	177,729
Ohio	5,310,506	6,802,493	7,129,525	5,283,426	6,912,962
Illinois	2,108,002	2,887,359	2,927,832	1,847,451	2,447,220
Indiana, Michigan	1,163,932	1,770,628	1,775,883	1,557,355	1,986,778
Wisconsin, Minn	276,807	303,370	367,326	329,526	372,966
Mo., Col., Wash., Cal.	395,968	397,731	324,263	267,777	271,921
Total	23,649,547	29,726,937	30,966,152	23,332,244	29,916,213

PRODUCTION OF PIG IRON BY STATES, 1914–1915.

States.	Production—Gross tons.				Increase.	Per cent., Increase.
	1915.	Per cent.	1914.	Per cent.		
Pennsylvania	12,790,668	42.75	9,733,369	41.72	3,057,299	31.41
Ohio	6,912,962	23.11	5,283,426	22.64	1,629,536	30.84
Illinois	2,447,220	8.18	1,847,451	7.92	599,769	32.46
New York, N. J.	2,104,780	7.04	1,559,864	6.69	544,916	34.93
Alabama	2,049,453	6.85	1,826,929	7.83	222,524	12.18
Ind., Mich.	1,986,778	6.64	1,557,355	6.67	429,423	27.57
Wis., Minn	372,966	1.25	329,526	1.41	43,440	13.18
W. Va., Ky., Miss	291,040	.97	236,393	1.01	54,647	23.12
Mo., Col., Cal	271,921	.91	267,777	1.15	4,144	1.55
Maryland	251,548	.84	195,594	.84	55,954	28.61
Virginia	251,346	.84	271,228	1.16	19,882*	7.33*
Tennessee	177,729	.59	216,738	.93	39,009*	18.00*
Mass., Conn	7,802	.03	6,594	.03	1,208	18.32
Total	29,916,213	100.00	23,332,244	100.00	6,583,969	28.22

* Decrease.

PRODUCTION OF COLD AND HOT AND WARM BLAST CHARCOAL PIG IRON, 1911–1915.

Kinds of Iron.	1911.	1912.	1913.	1914.	1915.
Cold blast	10,930	8,864	10,222	9,294	5,302
Hot and warm blast*	267,746	338,161	329,759	254,630	290,850
Total.....Gross tons.	278,676	347,025	339,981	263,924	296,152

* Includes iron made with charcoal and electricity.

PRODUCTION OF PIG IRON BY GRADES, 1914–1915, SHOWING INCREASE OR DECREASE BY GRADES.

Grades.	1915.	Per cent.	1914.	Per cent.	Increase.	Per cent.
Basic	13,093,214	43.77	9,670,687	41.45	3,422,527	35.39
Bessemer	10,523,306	35.17	7,859,127	33.68	2,664,179	33.90
Foundry	4,864,348	16.26	4,533,254	19.43	331,094	7.30
Malleable	829,921	2.77	671,771	2.88	158,150	23.54
Forge	316,214	1.06	361,651	1.55	45,437*	12.56*
Spiegeleisen	97,885	.33	79,935	.34	17,950	22.46
Ferro-manganese	129,072	.43	106,083	.46	22,989	21.67
All other	62,253	.21	49,736	.21	12,517	25.17
Total	29,916,213	100.00	23,332,244	100.00	6,583,969	28.22

* Decrease.

PIG IRON MADE FOR SALE BY GRADES IN 1915.

States.	Bessemer.	Basic.	Forge.	Foundry.	Malleable.	All other.	Total. Gross tons
Mass., Conn.				6,952			6,952
N. Y., N. J., Md.	74,067	187,040	7,745	795,698	177,482	32,331	1,274,363
Pennsylvania	566,925	584,538	84,590	866,406	81,579	95,709	2,279,747
Va., W. Va., Ala.	15	149,828	44,952	1,444,102		17,251	1,656,148
Ky., Tenn.	73,705	23,523	1,086	166,447	11,984	8,245	284,990
Ohio	126,571	595,741	35,982	717,742	207,402	1,748	1,775,186
Ind., Ill.	20,812	155,747		137,560	147,552	1,950	463,621
Mich., Wis., Minn., Mo., Col., Cal.	9,635	50,848		666,804	113,922	791	842,000
Total	871,730	1,747,265	174,355	4,801,711	829,921	158,025	8,583,007

METHODS BY WHICH ALL PIG IRON WAS CAST OR DELIVERED.

States.	Molten condition.	Sand cast.	Machine cast.	Chill cast.	Direct castings.	Total. Gross tons.
Mass., Conn.		7,802				7,802
N. Y., N. J., Md.	983,342	886,330	377,021	109,084	551	2,356,328
Pennsylvania	8,162,376	1,115,761	3,187,069	319,735	5,727	12,790,668
Va., W. Va., Ala.	653,097	1,493,241	231,129	101,617	5,406	2,484,490
Kentucky, Tenn.		239,172	37,707	8,199		285,078
Ohio	4,000,000	919,493	1,805,619	181,580	6,270	6,912,962
Ind., Ill., Mich., Col.	3,310,076	234,212	1,137,657		3,357	4,685,302
Wis., Minn., Mo., Cal.		180,458	192,906	20,198	21	393,583
Total	17,108,891	5,076,469	6,969,108	740,413	21,332	29,916,213

METHODS BY WHICH BASIC PIG IRON WAS CAST OR DELIVERED IN 1915

States.	Sand cast, machine cast, chill cast, etc.	Molten condition.	Total. Gross tons.
New York, New Jersey	217,187	539,402	756,589
Pennsylvania	1,706,227	5,429,137	7,135,364
Alabama, Virginia, Kentucky	206,002	577,010	783,012
Ohio	833,887	1,065,016	1,898,903
Indiana, Ill., Mich., Minn., Mo., Colorado	481,142	2,038,204	2,519,346
Total	3,444,445	9,648,769	13,093,214

METHODS BY WHICH BESSEMER AND LOW-PHOSPHORUS PIG IRON WAS CAST OR DELIVERED IN 1915.

States.	Sand cast, machine cast, chill cast, etc.	Molten condition.	Total. Gross tons.
New York, Maryland	139,223	443,940	583,163
Pennsylvania	1,614,858	2,733,239	4,348,097
West Virginia, Kentucky, Tenn., Ala.	188,505	76,087	264,592
Ohio	945,437	2,934,984	3,880,421
Illinois, Wisconsin	176,461	1,270,572	1,447,033
Total	3,064,484	7,458,822	10,523,306

Power Plant

Will Be Installed by Arthur G. McKee & Co.—Other Contracts

The contract for a power plant has been awarded to Arthur G. McKee & Co., Cleveland, by the Detroit Iron & Steel Co., Detroit. The equipment to be installed will consist of a 500 kilowatt turbo-generator and a 27,000 cubic foot turbo-blower, together with switch board, condensers, piping and other auxiliaries. Another improvement at this plant for which Arthur G. McKee & Co. have the contract consists of an extension to the present ore trestle. Work is now proceeding on both of these contracts.

Other contracts awarded Arthur G. McKee & Co., are as follows:

Contract for the reconstruction of the ore trestle at the plant of the Penn Iron & Coal Co., Canal Dover, O. This improvement will bring the material handling equipment at this plant up to the standard demanded by the increasingly severe service required.

The No. 3 blast furnace, recently built, and the No. 5 furnace now building, at the Steelton, Pa., plant of the Pennsylvania Steel Co., will be equipped with McKee automatic revolving stock distributors. Two McKee scale cars have also been ordered.

Orders by the Iroquois Iron Co., Chicago, for three McKee automatic revolving blast furnace stock distributors. One of these stock distributors is already in operation in furnace recently put in blast at that plant, and the others will be installed in the very near future.

By the Republic Iron & Steel Co., of Youngstown, contract for material handling equipment to be installed at the new blast furnace which will be built during the coming summer. This equipment will consist of 15 Baker suspension type ore bins, 300-ton coke bin, one 50-ton McKee stock transfer car, two McKee type scale cars, coke breeze handling system and other miscellaneous items of latest design.

The new blast furnace to be built by the Pulaski Iron Company, of Pulaski, Va., will be equipped with a McKee automatic revolving stock distributor. There are upwards of 70 of these distributors now in successful operation on American blast furnaces.

Scale Company Moves.—The Standard Scale & Supply Co., Pittsburgh, has moved from its former location on Water street, that city, to 1631 Liberty avenue, to a larger building better fitted for its requirements. The company is doing a large business in scales, trucks, engines, concrete mixers and contractors' equipment.

Truth About Strike

The facts in regard to the recent strike of employes of the tool steel department of the International High Speed Steel Co., Rockaway, N. J., are as follows: The company notified its employes about the middle of January that it would give them an advance in wages of 10 per cent commencing Feb. 1. When Feb. 1 arrived, the men refused to accept a 10 per cent advance, but demanded 20 per cent advance. The company declined to comply with the demand and the men stopped work. The following morning, a committee came to Managing Director C. Herbert Halcomb and told him that the men had been talking the matter over and had decided to accept the 10 per cent offered by the company. The men all returned to work the next day.

The Obenberger Drop Forge Co. has recently been succeeded by the Ladish-Obenberger Co., with offices and works at Cudahy, Wis.

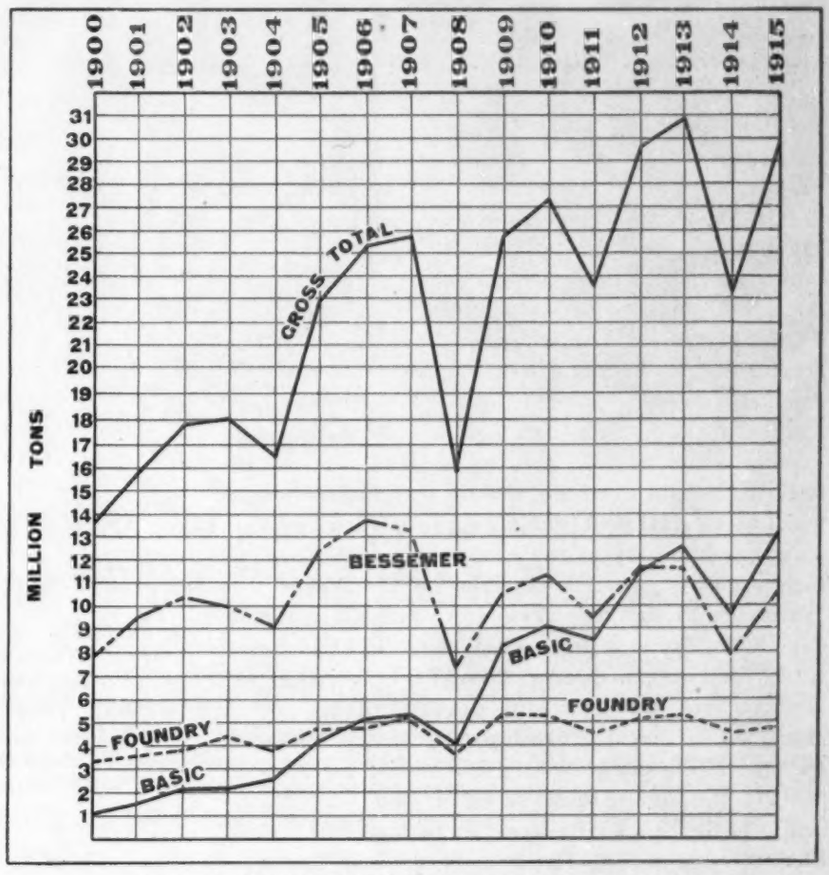


CHART SHOWING PRODUCTION OF PIG IRON, 1900-1915

Patriotism

Prevailing Sentiment Expressed at Association Banquet

"Our only toast is our country," were the patriotic words printed on the menu card of the twenty-third annual banquet of the New England Iron and Hardware Association held recently at the hotel Somerset. The decorations and the sentiment prevailing throughout the evening were in harmony with the single toast. The large ball room of the Somerset was decorated with the national colors, the guests being seated under a canopy of American flags, which covered the entire ceiling. The flower decorations were very lavish and the same color scheme was carried out of the national colors, red, white and blue. The attendance was the largest in the history of the association and the speaking program was of high order. The principal addresses were made by John L. Haines, of the Jones & Laughlin Steel Co., Col. H. P. Bope, vice president of the Carnegie Steel Co., and Hon. Richard W. Austin, member of congress from Tennessee.

The officers of the association are: Charles A. Adams, president; Wilbur B. Ayer, vice president; Charles H. Breck, treasurer; George J. Mulhall, secretary.

Single Tools Keep Market Moving

Seaboard Air Line Issues Only Important List—Chattanooga Steel Co. Enlivens Pittsburgh Market With Inquiries for Mill Equipment

THE machine tool market in the east continues devoid of important transactions. While demand continues of fair proportions, it is made up entirely of orders for one or a few tools each. Some of this business is for export, but most of it comes from domestic buyers. The domestic demand is confined to no particular industries, but is of a general and scattered character, reflecting activity in practically all lines of manufacture. The domestic munition makers continue to buy tools which are available for early delivery; in fact, most of the buyers at present are solely interested in machines that can be had at an early date and only a small percentage of the business now being placed is for the distant future. Several railroads have made purchases of machine tool equipment, but all of these are of minor importance. The most important railroad letting now under negotiation is that of the Seaboard Air Line on the list which was published in *The Iron Trade Review* at a recent date. The tools involved are urgently needed and it is expected this road will distribute orders within the week. The Russian commission in the Flatiron building, New York City, now expects within a few days to let contracts for the steel works and overhead electric traveling cranes on which it recently took bids.

Among concerns in the east, which are expanding their capacity, are the Ludlum Steam Pump Co., Watervliet, N. Y.; the Washburn Wire Co., Phillipsdale, R. I.; Potter & Johnson Machine Co., Pawtucket, R. I.; Shawingan Electro-Products Co., Baltimore; Norfolk Mfg. Co., Hartford, Conn.; Pedrick Tool & Machine Co., Philadelphia; Ingersoll-Rand Co., Easton, Pa., and Phillipsburg, N. J.; Eastern Tool Co., Bloomfield, N. J.; International Arms & Fuse Co., Bloomfield, N. J.; R. E. Parson Co., Bridgeport, Conn.; Electro-Dynamic Co., Bayonne, N. J., and others.

Southern Interest Enters Pittsburgh Market

THE Chattanooga Steel Co., which has completed plans for the construction of a large steel mill at Chattanooga, Tenn., has entered the Pittsburgh market for considerable heavy rolling mill equipment. The company has purchased a 34-inch blooming mill from the National Roll & Foundry Co., Avonmore, Pa., and is negotiating for 10 standard tin plate mills, a cotton tie mill and accessory equipment. The company will build two 75-ton open hearth steel furnaces. A Pittsburgh machine tool dealer has sold six large turret lathes to a manufacturer in western Pennsylvania. The National Steel Casting Co., which is building a new plant at New Cumberland, W. Va., has been figuring in the market for complete foundry and machine shop equipment. Demand for lathes for export continues heavy, but sellers are unable to entertain inquiries for foreign delivery, because of inability to meet specifications for shipment. Hubbard & Co., Pittsburgh, have been buying a number of planers, lathes and miscellaneous tool room equipment.

Chicago Market Full of Air Holes

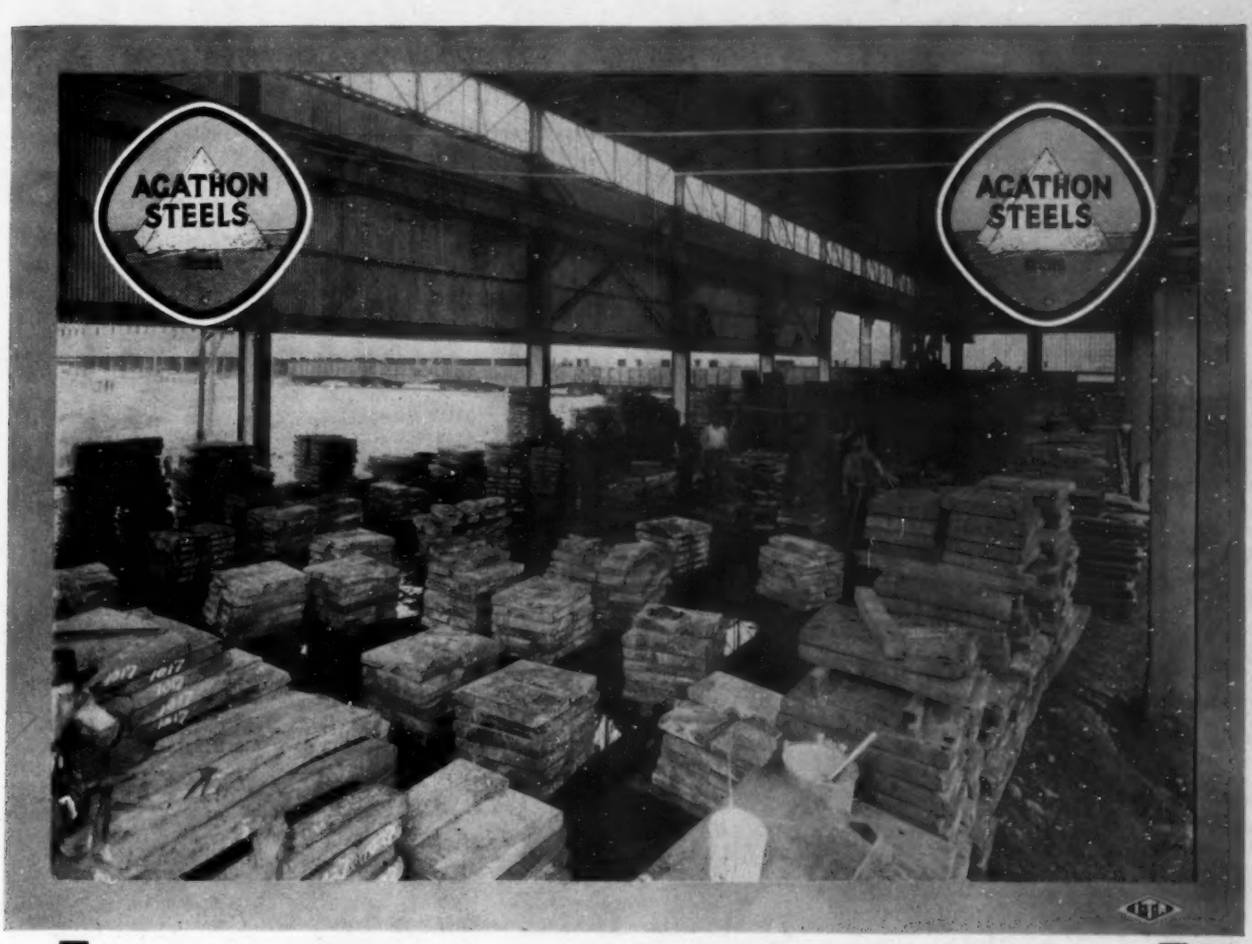
THE machine tool trade in Chicago seems somewhat erratic, some builders finding the demand from domestic users fairly active, while others are experiencing a lull. Automobile builders, as a rule, appear to be busy, and to meet the demand for cars, find it imperative to add to their equipment. Second hand machinery sales are improving. Standard makes of tools continue difficult to obtain. Users believe that shortage of machinery will continue, this belief being substantiated by the continuous buying movement for remote delivery. The Illinois Steel Co. has bought a 36-inch x 20-foot lathe for the Duluth plant of the Minnesota Steel Co., which will not be delivered until fall. The Inland Steel Co. is buying single tools to add to its equipment at Indiana Harbor.

Demand Improves at Cleveland

BUILDERS and dealers in machine tools at Cleveland find that the demand is more active than a week ago. Frequent inquiries are received for second hand tools and a fair amount of new business has been booked. Deliveries continue to retard the market to a great degree, but in spite of this handicap, conditions point to a very favorable month. One local builder shipped from its own plants slightly more than 300 machines in January, more than 400 in February, and expects to reach the 500 mark in March. These machines are being shipped on old orders, both export and domestic buyers being represented. This concern's business has been almost evenly divided between foreign and domestic users. A local dealer has been awarded a contract for 22 planers for shipment to Detroit, the smallest machine in the lot being a 42-inch tool.

Railroads Buying in Small Lots

THE aggregate of railroad buying of machine tools has been heavier since the first of the month, than during any similar period for the past four months. Orders placed with Cincinnati machine tool builders do not show any one large individual purchase, but the buying of single tools from that source has been constant and very frequent since March 1. The Cincinnati, New Orleans & Texas Pacific railroad will be in the market shortly for a small list of tools to be divided among its various repair shops, and the Canton Hughes Pump Co., Wooster, O., will install a large amount of equipment for the manufacture of finished steel products. Machine tool plants in Cincinnati are operating at 120 per cent, in comparison with 117 per cent during the last quarter of 1915, and 125 per cent during the third quarter of the same year, using the first quarter of 1915 as a basis of 100 per cent, at which time shops were supposed to be running at a maximum.



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Cleveland Office: Hickox Bldg. - The Hamill-Hickox Co., District Representative

Say you saw it in THE IRON TRADE REVIEW

Among New England Factories

MACHIAS, ME.—The Machiasport Ship Building Co. has been incorporated; $300,000 capital; by A. D. McFaul and George B. Boynton.

NEW SHARON, ME. — The state has awarded a contract for a steel superstructure single-span bridge over Sandy river to cost $25,000.

OAKFIELD, ME. — The Oakfield Light & Power Co. has been incorporated; $10,000 capital stock; by Nelson C. Martin, Preston H. Martin and Walter E. Mathews.

PORTLAND, ME.—The Paradox Pump Co. has been incorporated to build pumps, engines, motors, machinery, etc.; $50,000 capital stock; by Clark P. Dunton, David E. Moulton and Alonzo L. Holley, Lewiston, Me.

PORTLAND, ME.—The M. & S. Gear Co. has been incorporated to build differential gears and automobile parts; $2,000,000 capital stock; by T. L. Croteau, A. B. Farnham, Clarence G. Trott, Charles W. Hamilton and George S. Soule.

PORTLAND, ME.—The Burling Engineering & Construction Co. has been incorporated; $100,000 capital stock; by Karl R. Miner and A. O. Greist, both of Yonkers, N. Y., Charles C. Upham and Charles R. Scott, both of New York City, B. L. Merryman, William B. Nulty and William M. Bradley, all of Portland.

SKOWHEGAN, ME. — Bell Bros., Salem, Mass., will build a 2-story, 40 x 225-foot shoe factory in Skowhegan.

BERLIN, N. H.—The United States government will build a brick and stone, 2-story and basement, 64 x 75-foot post office building on Main street to cost $65,000.

KEENE, N. H.—The New Brattleboro Overall Co. is contemplating the erection of a brick, 3-story, 41 x 124-foot factory building on Norway avenue.

PORTSMOUTH, N. H.—The Morley-Button Mfg. Co. is having plans prepared for a factory building. The architects are Densmore & LeClear, 88 Broad street, Boston.

BOSTON.—The Boston Auto Craft Co. has been incorporated; $5,000 capital; by John Finnan, Lewis J. Olson and J. S. Kelley.

BOSTON.—The Leary Muffler Co., Inc., has been incorporated; $100,000 capital stock; by D. Earle Osgood and William W. Peck.

BOSTON.—The Cement Specialty Mfg. Co. has been incorporated; $25,000 capital stock; by Jakob H. T. Kirk, William Kenney and Thomas S. Healey.

BOSTON.—New England Appliance Co. has been incorporated to build motor vehicles; $10,000 capital stock; by Fred G. Smith, Jacob A. Smith and William S. Brunt.

BOSTON.—The Diamond Link Fence Co. has been incorporated; $10,000 capital stock; by Alfred L. West, Mary C. Booth and William G. Burns.

BOSTON.—The Engineering Construction Co. has been incorporated; $10,000 capital; by Frank Sola, M. J. Mastrangelo and M. Mastrangelo.

BOSTON.—The Massachusetts Auto-Ped Co. has been incorporated to build motor vehicles and supplies; $50,000 capital; by Frank G. Crowley, Edward G. Parrott and B. Smith.

BOSTON.—The T. A. Gillespie Co. has been awarded a contract at $363,744.50 by the city of Boston to build a reinforced concrete and structural steel tunnel in South Boston.

BOSTON.—Bids have closed for a reinforced concrete, 4-story, 76 x 127-foot factory to cost $100,000 at Blandford and Cummington streets for Chauncy Thomas & Co., makers of auto bodies.

BOSTON.—Armour & Co. are to erect a 4-story and concrete sales building on Berkeley street.

BROCKTON, MASS.—The Colonial Tool & Machine Co. has been incorporated; $50,000 capital stock; by Alonzo R. Marsh, Stewart B. McLeod and Marguerite Byrne.

CHATHAM, MASS.—The Chatham Freezing Co. is building a brick and concrete, 4-story, 70 x 70-foot cold storage plant at Stage harbor.

CHELSEA, MASS.—The W. A. Snow Iron Works, Boston, will build a brick, 2-story, 50 x 82-foot addition to its factory at 187 Third street.

EAST BOSTON, MASS.—The Boston Storage Co. will build a 2-story, 40 x 150-foot storage building on New street.

EAST BRIDGEWATER, MASS.—The Edison Electric Illumination Co., Boston, has awarded a contract for a brick, 1-story, 60 x 80-foot addition to its plant in East Bridgewater.

EVERETT, MASS.—A brick, 2-story and basement, 40 x 85-foot office and factory building will be built on Paris street. Charles H. Tenney & Co., Boston, are the engineers.

FALL RIVER, MASS.—The Booth & Chase Co. has been incorporated as general contractor; $10,000 capital stock; by George H. Booth, Walter B. Chase and Harry C. Mambly.

FITCHBURG, MASS.—The Fitchburg Elevator Repair Co., has located in the Dean Machine shop, Water street.

GARDNER, MASS.—The Gardner Auto Co. has plans under consideration for a brick, 3-story, 80 x 167-foot building at Main and Chestnut streets and a 2-story, 60 x 100-foot addition to its present garage on Chestnut street.

HOLYOKE, MASS. — Fire in the 2-story brick building at 75 Main street, owned and occupied by the C. F. Sullivan Co., plumber and steamfitter, did $30,000 damage.

LAWRENCE, MASS.—The Davis Foundry Co. will erect a plant at Market and Parker streets.

LAWRENCE, MASS. — Carrie C. Meigs, Lowell, will build a brick, 2-story and basement, 72 x 146-foot mercantile building to cost $50,000 on Essex street.

LAWRENCE, MASS. — The Blandin Co. has been incorporated to make belting, machinery, tools, mill supplies, etc.; $10,000 capital; by Ira D. Blandin, John A. Abercrombie and R. D. Abercrombie.

LAWRENCE, MASS. — The Burgess-Lang Co. is negotiating for the purchase of a large tract in Lawrence to be used as a site for a factory building. This company already owns extensive plants in Springfield and Haverhill.

LOWELL, MASS.—The Appleton Co., has awarded a contract for a 76 x 200-foot mill dyehouse and three 5-story and basement 50 x 200-foot stair towers.

MALDEN, MASS.—The Ehrman Mfg. Co., Boston, will build a brick mill construction, 3-story, 40 x 200-foot factory in Malden.

MERRIMAC, MASS.—The car barn of the Massachusetts Northeastern Street Railway Co. was damaged by fire, causing a loss of $50,000.

MILFORD, MASS.—The F. W. Mann Co., auto truck maker, has bought a 1-story building on Central street and will increase its capacity.

QUINCY, MASS.—The city will build two brick and stone, 2-story and basement, 120 x 162-foot school buildings to cost $110,000 each at Quincy point and Norfolk Downs.

SPRINGFIELD, MASS. — The Hampden Construction Co. has been incorporated; $1,000 capital; by Paul T. Curtis, D. T. McCauley and M. H. Curtis.

SPRINGFIELD, MASS. — Engineers McClintock & Craig, 33 Lyman street, have started to draw plans for a power plant with capacity of 20,000 kilowatts, to be erected by the United Electric Light Co., Springfield.

WATERTOWN, MASS.—The Hood Rubber Co. is building a concrete and steel, 1-story, 100 x 120-foot factory and a warehouse of the same construction and size to cost $20,000 each.

WESTFIELD, MASS.—The Hampden Toy Co., manufacturer of novelties and stamped metal articles, will build a 3-story addition, 27 x 50 feet.

WHITMAN, MASS.—The G. C. Roberts Tack Co., has bought the brick factory buildings and eight acres of land of the Whitman Mfg. Co., will install additional steam-operated machinery.

WOBURN, MASS.—Explosion wrecked one building and damaged another at the plant of the New England Mfg. Co., which is engaged in manufacturing high explosives.

WORCESTER, MASS.—Reed & Prince Mfg. Co. has awarded contract for a brick, 3-story, 56 x 90-foot addition to its plant to cost $10,000.

WORCESTER, MASS.—The Morgan Spring Co. has purchased the property of the National Mfg. Co., wire goods maker. 19 Summer street, for $37,000, and will continue the business.

WORCESTER, MASS.—A contract has been awarded for a brick, mill construction, 4-story, 60 x 140-foot addition to cost $25,000 to the factory of the New England Corset Co., Inc., 140 Green street.

WORCESTER, MASS. — Franklin Square Electric Co. has been incorporated; $5,000 capital stock; by William R. McLaughlin, Arthur W. Wilson and Edward F. Coghlin. The company has bought the William L. Browne Electric Co.

WORCESTER, MASS.—The Worcester Electric Light Co. will build a steel 68 x 78-foot addition to its Webster street plant, to be equipped with a 20,000-kilowatt turbine-generator and electric machinery to cost $250,000, which will double the capacity of the plant.

PAWTUCKET, R. I.—The Phillips Insulated Wire Co. has increased its capital stock from $100,000 to $2,500,000.

PAWTUCKET, R. I.—The Potter & Johnson Machine Co. has let a contract for the erection of a 1-story, 101 x 212-foot machine shop. Several cranes will be installed.

PAWTUCKET, R. I.—Fire in the plant of the Pawtucket Screw Co., 133 Hughes avenue, did $2,000 damage to the building and contents.

PHILLIPSDALE, R. I.—The Washburn Wire Co. has let a contract for the erection of a 1-story, 80 x 86-foot wire mill addition.

PROVIDENCE, R. I.—The Aberthaw Construction Co., Boston, has the contract for the brick, steel and concrete, 6-story, 50 x 130-foot with a wing 35 x 50 feet, addition, to the

Crawford Ore from the Dean-Itasca Mine on the Mesabi Range

The ore is non-bessemer, of good coarse structure. Dean-Itasca mine shipments for 1915 were 486,374 tons, mostly since August 1. For 1916 they will be considerably greater.

A complete analysis of Crawford Ore from Dean-Itasca Mine in natural state and dried at 212° Fahr.

	Dried 212°	Natural
Iron	58.35	50.2451
Phosphorus	.065	.05597
Silica	6.03	5.1924
Manganese	1.00	.8611
Alumina	3.40	2.9277
Lime	.16	.1377
Magnesia	.12	.1033
Sulphur	.031	.0266
Volatile Matter	5.74	4.9427
Moisture	13.89	

Crawford Ore Guarantee for 1916, 51.50 Per Cent Iron, Natural

The output of this mine during 1916, together with our five other mines, gives us an unusually large tonnage.

We are now taking contracts for this ore and will be glad to figure on your requirements for the coming season.

THE TOD-STAMBAUGH COMPANY

Perry-Payne Building

CLEVELAND :: :: :: :: OHIO

plant of the Brown & Sharpe Mfg. Co., on Beach and Holden streets.

PROVIDENCE, R. I. — Charles Pay has awarded a contract for a brick and steel, 2-story, 29 x 40-foot workshop on South Water street.

BALTIC, CONN.—The Baltic Mills Co. will build a brick and concrete, 3-story, 84 x 220-foot mill addition to its plant.

BRIDGEPORT, CONN. — The Mansfield Foundry Co., New York, has recently purchased property on Bishop avenue and contemplates the erection of a foundry.

BRIDGEPORT, CONN.—The R. E. Parson Co. is erecting a gray iron foundry which will be devoted to general jobbing work. The company will furnish castings for the Standard Mfg. Co.

BRISTOL, CONN.—The Bristol Vulcanizing Equipment Co. has been incorporated to acquire the business of Sanford F. Morrison and to make metal goods; $25,000 capital stock; by Sanford F. Morrison, Peter L. Mott and Henry S. Beals.

HARTFORD, CONN. — The Earnshaw Mfg. Co. has been organized; $45,000 capital; by Henry P. J. Earnshaw, John F. Forward and Edward J. Daly.

HARTFORD, CONN.—The Rowe Calk Co. is building a 1-story, 50 x 60-foot addition to its Plantsville plant where drop-forged horseshoe calks will be made.

HARTFORD, CONN. — The Aberthaw Construction Co., Boston, has taken out a permit to build a reinforced concrete, 4-story, 60 x 224-foot addition to the plant of the Colt's Patent Firearms Mfg. Co., to cost $125,000.

HARTFORD, CONN.—H. H. Denney, P. H. Quinlan and Geo. E. Quinn, formerly foremen for the Colt's Patent Fire Arms Mfg. Co., have organized the Norfolk Mfg. Co. and will manufacture steel clamps, hand screws and vices. The company will build a 2-story brick factory, 50 x 100 feet in Norfolk, and this is expected to be ready for operating next fall.

HARTFORD, CONN. — Plans have been drawn for a concrete and steel, 2-story and basement, 70 x 210-foot garage at Washington and Park streets for the Packard Motor Car Co.

HARTFORD, CONN.—The Hartford Automobile Parts Co. has decided not to move to New Britain, as planned, but will retain the old Cheney mill property and operate the New Britain works as a branch. The company plans to increase its capital from $300,000 to $600,000.

HARTFORD, CONN. — Peter A. Frasse & Co., New York, maker of steel tool equipment, has bought 2 1/3 acres of land in the boulevard and will erect a reinforced concrete 3-story, 50 x 300-foot factory, with a wing at each end which will be about 50 feet square. The new building will be the headquarters for distributing the company's products in this section of the country.

MECHANICSVILLE, CONN.—The Putnam Light & Power Co. has taken bids on the structural contract for a new power plant addition.

MILFORD, CONN. — The Stanford Steel Products Co. has been incorporated to make cold rolled, strip and planished steels and other metals; $30,000 capital stock; by George I. Stanford, Franklin I. Mallory and Clyde Milne.

NEW HAVEN, CONN. — The National Welding Co. has been organized; $7,500 capital; by John F. Shuford, Joseph Kurzweil and Minnie A. Spanutius.

PLAINVILLE, CONN. — The Rockwell-Drake Co., builder of machinery, etc., plans to start work this summer on three brick, 1-story, 100 x 130-foot factory buildings.

PLANTSVILLE, CONN. — The Blakeslee Forging Co. has let a contract for the erection of a 1-story and basement, 50 x 80-foot forge shop.

SHELTON, CONN.—The Sidney Blumenthal Co. has awarded contract for a concrete, 4-story, 75 x 216-foot factory addition to its plant.

STAFFORD SPRINGS, CONN.—The Stafford Worsted Co. is about to let a contract for the construction of a 1-story power plant.

TERRYVILLE, CONN. — The Eagle Lock Co. will build a brick and steel 1-story, 30 x 130-foot addition to its plant.

TORRINGTON, CONN. — The Excelsior Needle Co., previously noted as contemplating an extension, will build a brick, 1-story, 64 x 72-foot addition to its factory where ball bearings will be manufactured.

WATERBURY, CONN. — The American Brass Co. has awarded a foundation contract for a brick and steel, 1-story, 70 x 240-foot addition to its tube mill and a 92 x 160-foot addition to its rolling mill on Washington avenue.

WESTPORT, CONN. — The contract for building the superstructure of a bridge over the Saugatuck river to cost $35,600 has been awarded to the McHarg-Barton Co., New York.

WILLIMANTIC, CONN. — A. G. Turner will build a reinforced concrete 2-story and basement, 50 x 250-foot factory, to cost $35,000 at Bank and Valley streets.

Along the Middle Atlantic Seaboard

BROOKLYN, N. Y.—The building and equipment of the Franklin Machine & Steam Boiler Works, 11 Franklin street, was damaged by fire.

BROOKLYN, N. Y.—Henry Holder Jr., architect, 242 Franklin avenue, is taking bids for a 1-story factory, 94 x 150 feet, to be erected at Glendale, L. I., for Wm. Greilich, 84 Garden street, Brooklyn.

BROOKLYN, N. Y.—P. Tillion & Son, architects, 381 Fulton street, are drawing plans for two stories, 80 x 100 feet, to be added to the present plant of E. D. Stache Sons, 70 Commercial street.

BUFFALO.—The American Body Co. will build a $10,000 addition to its plant at Niagara street.

COHOES, N. Y.—Fuld & Hatch have let a contract for the erection of a 4-story, 40 x 50-foot factory addition.

LONG ISLAND CITY, L. I., N. Y.—John Wagner, Fisk avenue, has let a contract for the erection of a 2-story, 60 x 70-foot factory building.

LONG ISLAND CITY, L. I., N. Y.—The National Sugar Refining Co. has completed plans for the erection of a 1-story, 52 x 189-foot factory addition.

NEW YORK.—The Ingersoll-Rand Co., 11 Broadway, is completing plans for considerable additions at its plants in Easton, Pa., and Phillipsburg, N. J. At Phillipsburg, a 300-foot foundry extension will be made, the compressor department will be doubled, and the drill department will be enlarged.

TOTTENVILLE, S. I., N. Y.—The Hilliard Mfg. Co. is extending its plant by the erection of a 30 x 50-foot structure, which is to be used as a machine shop.

WATERVLIET, N. Y.—The Ludlum Steam Pump Co., Colonie, contemplates the erection of a 1-story, 100 x 600-foot factory addition.

BAYONNE, N. J.—The Electro-Dynamic Co. is erecting a 100-foot extension to its plant.

BLOOMFIELD, N. J.—Plans have been filed for a 1-story plant to be erected at a cost of $18,000 by the Eastern Tool Co.

BLOOMFIELD, N. J.—The International Arms & Fuse Co. has filed plans for an addition to its plant in Bloomfield.

ELIZABETH, N. J.—The General Carbonic Co. contemplates enlarging its plant.

ELIZABETH, N. J.—The Campbell Art Co. has purchased a plot of ground 200 x 300 feet in Newark avenue and will erect a new plant at a later date. Robert H. Haines is treasurer of the concern.

ELIZABETH, N. J.—The contract for the foundry extension of the S. L. Moore & Sons corporation has been awarded to Levering & Garrigue, New York. The foundry will be 136 x 140 feet and will be of steel construction throughout.

JERSEY CITY, N. J.—The Jersey City Metal Co. has been incorporated to prepare steel and metals; $100,000 capital stock; by Henry Whittaker, Philadelphia, John E. Sandmeyer Jr., John E. Sandmeyer, Newark.

NEWARK, N. J.—Jacob Meisol has been granted a permit for the erection of a 2-story brick factory at 22 Bedford street.

NEWARK, N. J.—The Butterworth Judson Co. will erect two additions to the plant to cost $11,000.

NEWARK, N. J.—F. G. Leibe & Son, 39 Grafton avenue, have plans in progress for the erection of a 2-story, 40 x 60-foot addition.

NEWARK, N. J.—Edward A. Zusi has contracted for the erection of a 1-story brick foundry at 115 Adams street.

PATERSON, N. J. — The Imhoff-Berg Silk Co. has purchased 25 lots on Chadwick street and will erect a modern dyehouse to cost $40,000.

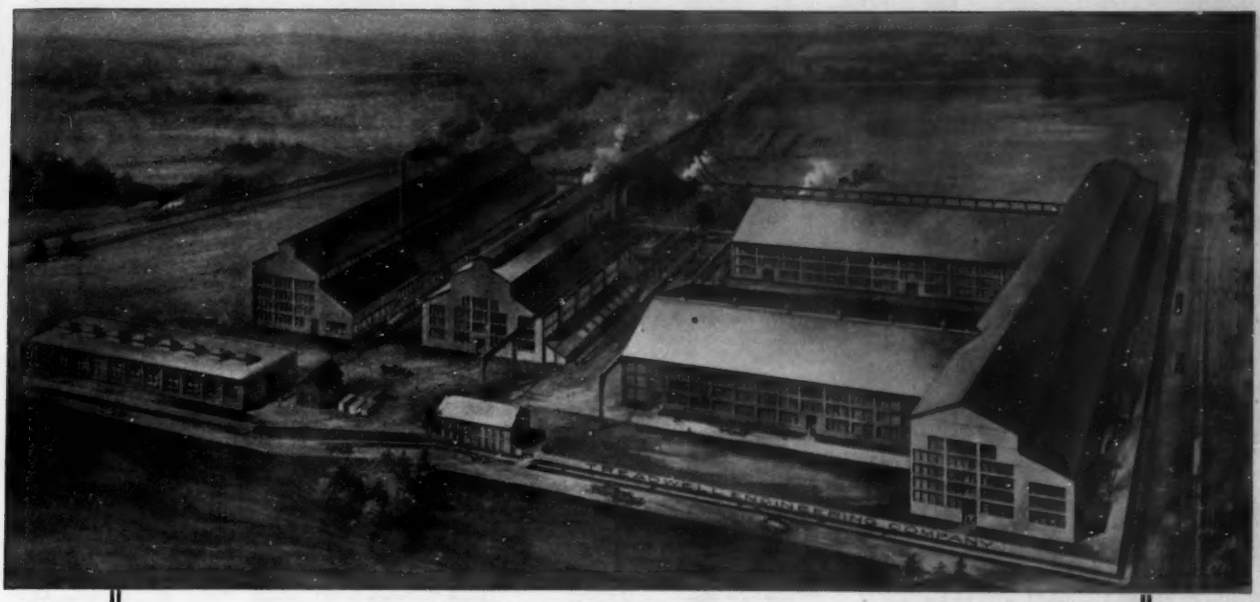
PAULSBORO, N. J.—The Vacuum Oil Co. has purchased 474 acres of land from the Mellon street syndicate along the Delaware river and will erect a plant thereon.

PERTH AMBOY, N. J.—The Raritan Copper Works will build a 1-story addition to its engine and power house.

ROSELLE, N. J.—The Mehl Machine Tool & Disc Co. has purchased a plot of ground on First avenue and will construct a modern factory building. The structure will be 50 x 155 with a 50 x 60-foot addition. The company will manufacture munitions.

SAYREVILLE, N. J.—Fire caused slight damage of the foundry of the Sayre & Fisher Co.

SOMERVILLE, N. J.—The Somerville Iron Co. has been incorporated to manufacture pipes, castings, etc., and to take over as a going concern the property of the Somerville Iron works; $1,500,000 capital stock; by



Bird's-Eye View of plant of Treadwell Engineering Company, Easton, Pennsylvania

TREADWELL.

Treadwell Facilities

The Buildings:

Our large, new, strictly modern plant consists of fourteen buildings, including an Iron Foundry, Steel Foundry, Machine Shop, Erecting Shop, Forge Shop, Pattern Shop, Carpenter Shop, Storage Buildings, etc.

The Equipment:

Each building is abundantly supplied with the proper up-to-the-minute equipment for producing maximum speed and economy, without sacrificing quality.

The Location:

On a high plateau about two miles west of Easton, Pennsylvania, in the center of a 28-acre plot of ground— the buildings occupying fully one-half—the Treadwell Engineering Company is located.

It is bounded on the West by the Eastern & Northern Railroad—a tributary of the Lehigh Valley Railroad; on the North by the Easton, Allentown & Philadelphia suburban railway; and on the East, by the Easton & South Bethlehem suburban railway.

The Object:

The object of our unusual facilities, is to better enable us to supply you with **Electric Furnace Steel Castings; Gray Iron Castings; Machinery** designed for special purposes; **"Stoever" Pipe Threading Machines; Hydraulic Machinery; Rolling Mill Equipment,** etc.

ALWAYS KEEP THIS IN MIND—**"TREADWELL" MEANS "SERVICE"**

TREADWELL ENGINEERING COMPANY

EASTON, PENNA.

NEW YORK PHILADELPHIA CHICAGO

TREADWELL.

ENGINEERING

Say you saw it in THE IRON TRADE REVIEW

Marx and Benjamin Lissberg, 233 Broadway, New York; and W. J. Kirby, of 278 East Main street, Somerville.

SOUTH ORANGE, N. J.—The International Chemical Corporation has been incorporated to deal in chemicals; $300,000 capital stock; by Edmund R. Clary, Eugene H. Leslie, Edward Moss, Orange.

TRENTON, N. J.—The National Biscuit Co. will erect a 3-story storehouse on Pennington avenue.

TRENTON, N. J.—Fire caused a serious loss to the plant of the National Radiator Co. on Whitehead road.

TRENTON, N. J.—The Mycock Machine Co. has been incorporated to manufacture machinery; $50,000 capital stock; by W. Henry Mycock, John W. Mycock and George F. Mycock.

WASHINGTON, N. J.—The Cornish Piano & Organ Co. will shortly build an extensive addition and begin the manufacture of phonographs.

WILDWOOD, N. J.—The Bethlehem Steel Co. has purchased 12,000 acres near Wildwood. It is not known what the steel company intends to do with regard to this property.

YARDVILLE, N. J.—The Martin Bros. have purchased a 5-acre plot along the Pennsylvania railroad and will erect a factory structure for the manufacture of concrete pipes.

AMBRIDGE, PA.—The Asbestos Protected Metal Co. has purchased six acres at Fourteenth street and the Economy Belt Line railroad and will erect three large buildings.

AVONMORE, PA. — The Fahnestock Mfg. Co., with offices in the Union Bank building, Pittsburgh, has acquired the plant of the Avonmore Steel Casting Co. and will improve and enlarge the plant facilities for the house containing 248 cells in the new prison at Lockport.

BALD EAGLE, PA.—The Pennsylvania railroad plans to construct a bridge across Little Bald Eagle creek. A. C. Shand, Philadelphia, is chief engineer.

BUTLER, PA.—The Bessemer & Lake Erie railroad will build a bridge 1,800 feet in length. The piers and abutments of the present bridge will be enlarged, requiring 10,000 cubic yards of concrete.

EAST PITTSBURGH. — The Westinghouse Electric & Mfg. Co. will build a 3-story laboratory for research work, the contract for which has been awarded to Toupe, Beil & Conley, Inc., Pittsburgh.

ERIE, PA.—The city of Erie plans to extend and improve water works system.

FRANKLIN, PA.—The C. F. Hamilton Co. has been incorporated; $5,000 capital stock; by C. F. Hamilton, Bess W. Hamilton and F. E. Crosby, to engage in general engineering and construction work.

GARRETT, PA.—The Baltimore & Ohio railroad will construct a bridge across Buffalo creek, east of Garrett. F. L. Stuart, Baltimore, is chief engineer.

GREENVILLE, PA.—The Bessemer & Lake Erie railroad will replace the bridge across the Little Shenango river at Greenville. The state water supply commission has approved the application of the railroad company.

JOHNSTOWN, PA.—Stockholders of the Pittsburgh Railways & Supply Co. have formally taken over the Seward plant. It is reported that a steel foundry will be constructed.

LANCASTER, PA.—Bids will be received by the water commission until March 22 for five horizontal, 2-stage centrifugal pumps, having capacities of 2,100 to 3,500 gallons per minute; for three horizontal single-stage centrifugal pumps, having capacities of 3,500 to 4,900 gallons per minute, and two vacuum pumps.

NATRONA, PA.—The citizens of Natrona and Braeburn have asked county commissioners of Allegheny county to construct a bridge across the Allegheny river, between Braeburn and Natrona.

NEW BRIGHTON, PA.—The board of education has asked W. G. Eckles, architect, New Castle, Pa., to prepare plans for a $100,000 high school of fireproof construction.

NEW CASTLE, PA.—The Burton Powder Co., which recently purchased the C. E. Fullerton farm, will build a large chemical plant. The buildings will all be of reinforced concrete.

OIL CITY, PA. — The National Concrete Sign Post Co. has been incorporated; $30,000 capital stock; by R. C. Beers and others, to manufacture posts, pipe and other reinforced concrete products.

PHILADELPHIA.—Baxter, Kelly & Faust have let a contract for the erection of a 1-story engine room addition.

PHILADELPHIA.—The Pedrick Tool & Machine Co. has been granted a permit for the erection of a 2-story, 12 x 22-foot addition and a 1-story addition, 22 x 36 feet.

PHILADELPHIA.—The Philadelphia Textile Machinery Co., has let a contract for the erection of a 1-story, 252 x 262-foot addition to its factory.

PHILADELPHIA.—E. S. Dyer, engineer, Land Title building, is taking bids on the construction of a power house and factory addition to the plant of Hafleigh & Co., American and Somerset streets.

PHILADELPHIA.—The Chamber of commerce of Philadelphia announces that the Niagara Oxygen Co. with plants at Buffalo and Niagara, N. Y., has been induced to locate a plant in the city of Philadelphia.

PHILADELPHIA. — Herman Miller, architect, 1420 Chestnut street, is taking bids on the erection of a 2-story, 51 x 87-foot, machine shop addition for the Wicaco Screw & Machine Co., 712 Cherry street

PHILADELPHIA.—The Armstrong & Latta Co. has been granted a permit for the erection of a 1-story brick circular machine shop, 360 feet in diameter, at Twenty-sixth street and Pennsylvania avenue for the Baldwin Locomotive Works.

PHILADELPHIA.—The E. W. Mark Construction Co. has been granted a permit for erecting at Eighteenth and Hamilton streets an 8-story brick and concrete factory building, 99 x 397 feet, for the Baldwin Locomotive Works.

PHILADELPHIA.—The Chas. McCaul Co. is estimating on plans for a group of manufacturing buildings to be erected at Hartford, Conn., for the Underwood Typewriter Co. The plans provide for two 5-story buildings, 45 x 200 and 50 x 163-foot; three 6-story buildings, 50 x 185, 40 x 100 and 40 x 100 feet and a 4-story building, 41 x 50 feet.

PITTSBURGH.—A. E. Thompson, Rutherford, N. J., has purchased six lots, 109 x 120 feet, from the East End Savings & Trust Co. and will erect a 6-story warehouse.

PITTSBURGH. — The Central Tube Co., First National Bank building, has increased its capital stock to $655,000. The company operates a plant at Economy, Pa.

PITTSBURGH. — W. G. Wilkins & Co., architects, are preparing preliminary sketches for a proposed 12-story office building, 40 x 109 feet, in Duquesne Way, for the Atlantic Refining Co.

PITTSBURGH.—The Pike Coal & Coke Co. has been incorporated to acquire coal, clay and timber lands; $1,000,000 capital stock; by William Boyd, W. I. N. Loft and George W. Morgan.

PITTSBURGH.—Hubbard & Co., Pittsburgh, have awarded contracts to Samuel Austin, Cleveland, for a reinforced concrete building, 80 x 480 feet, to replace a building damaged by fire recently.

PITTSBURGH.—The Hussey Binns Steel Co. has been incorporated; $5,600 capital stock; by R. H. Binns and E. B. Alsop, Sewickley Heights, and R. H. Binns Jr., C. G. Hussey, Herman G. Veeder and Edward H. Binns, Pittsburgh.

READING, PA.—Mulhenberg Bros., architects, are taking bids for the erection of a 1-story, 70 x 400-foot addition to the plant of the Carpenter Steel Co.

SCOTTDALE, PA.—The Atlas Powder Co., Wilmington, Del., controlled by the Du Pont interests, will erect a plant at Scottdale for the manufacture of caps.

SHARON, PA.—The Shenango Machine Co. has increased its capital stock from $60,000 to $75,000.

SHARON, PA. — The Sharon Hydraulic Stone Co. has been incorporated; $10,000 capital stock; by W. H. Garner, president, and H. W. Godfrey, secretary and treasurer. Hydraulic machinery will be installed.

WILKESBARRE, PA. — McCormick & French, architects, have completed plans for a 4-story, 55 x 114-foot factory building, a 2-story, 20 x 64-foot shop, a 27 x 66-foot garage, and a 25 x 52-foot power house, with 24 x 41-foot wing, to be erected at Kingston, Pa., for the Jenkins-Kirby Co.

WILMINGTON, DEL.—The Bancroft & Sons Co. is taking bids on the construction of a 1-story, 21 x 51-foot woodworking building.

WILMINGTON, DEL. — The Pyrites Co., Ltd., an English corporation, has purchased from the Lobdell Car Wheel Co., 77 acres at the junction of the Christiana and Delaware rivers and will erect a plant for the manufacture of chemicals, including acids that enter into the manufacture of high explosives. The structural steel contract has been let.

BALTIMORE.—The Baltimore Tube Co. has let a contract for the erection of a 1-story, 62 x 225-foot addition to its factory.

BALTIMORE, MD.—The Shawingan Electro-Products Co. has let a contract to the Guarantee Construction Co., 90 West street, New York, for the erection of two additions, 40 x 150 and 60 x 70 feet respectively.

BALTIMORE.—The Baltimore Dry Dock & Shipbuilding Co. is having plans drawn by its engineering department for the erection of a tool house and ship ways, to cost approximately $200,000.

Switch and Frog Plant for Wm. Wharton, Jr., & Co. at Easton, Pa. (Photo taken Oct. 23, 1914) Five months after Ground was broken

This Big Plant Was Practically Completed in One Year by W·C·K

GROUND was broken for the new Wharton switch and frog plant in June, 1914. In July, 1915, the partial operation of the plant was begun.

Under the direction of vice-president of the Wharton Company the entire design and construction of this plant were handled by Westinghouse Church Kerr & Company. It affords a typical instance of the efficiency, economy and *speed* attained by the use of W. C. K. service. Particular attention was paid to the "routing" of heavy parts through the factory—to minimize the movements necessary.

While we are primarily engineers and concern ourselves first with the design of plants from the standpoint of efficient operation —we are prepared to take over every detail of the construction with our own engineering and constructing forces.

In dealing with us on this basis you assure both *speed* and *economy*. You have one organization to look to for the successful and fast construction of your new plant. Our vast resources for purchasing and directing traffic are of inestimable value in these times of mounting prices and congested freight terminals.

Yet the successful operation of the plant is our first concern—the correct "routing" of materials in progress of manufacture—sane shop layout—minimized "fixed charges."

ENGINEERS *and* **CONSTRUCTORS**

A purely engineering organization with nothing to sell except services.

W·C·K

We are ready to consult and co-operate with your engineers

WESTINGHOUSE CHURCH KERR & CO.

ENGINEERS AND CONSTRUCTORS

37 Wall St., New York

CONWAY BLDG., CHICAGO PACIFIC BLDG., SAN FRANCISCO

Activities in the Central States

BELLAIRE, O.—The Baltimore & Ohio railroad will build a double-track line from Bellaire to Bridgeport. F. L. Stuart, Baltimore, is chief engineer.

COLUMBUS, O.—The John Keller Mfg. Co. has been incorporated; $10,000 capital stock; by F. E. McKean, M. McLush, Harry Brenner, John Keller and E. Keller.

SPRINGFIELD, O.—The Steel Products Engineering Co. has been incorporated; $100,000 capital stock; by J. E. McAdams, D. E. Freeman, E. E. Burkhart, L. M. McAdain, and W. G. Pickrell.

YOUNGSTOWN, O.—The city contemplates the erection of a bridge at Himrod avenue. F. N. Lillie is city engineer.

YOUNGSTOWN, O.—The Twin City Fireproofing Co. has been incorporated; capital stock $10,000; by E. M. Strohm, H. M. Parker, R. K. Wormer, H. D. Fisher and E. C. Phillips.

YOUNGSTOWN, O.—The board of education will erect a new building, 250 x 500 feet, at Windsor, Tangent and Kent streets. W. N. Ashbaugh is director of schools and E. R. Thompson is the architect in charge.

YOUNGSTOWN, O.—The Youngstown Radiator Co. has been incorporated; $25,000 capital; by John R. Gabrielson, Sophie Gabrielson, Ernest C. Swanson and C. F. Newgreen, all of Warren, O.

BERKELEY SPRINGS, W. VA.—The Luten Bridge Co., York, Pa., will build two reinforced concrete bridges for the board of county commissioners.

CHARLESTON, W. VA.—C. H. Dinnon is preparing plans for the city for a water plant.

CLARKSBURG, W. VA.—The Monongahela Valley Traction Co. will build a passenger and freight station, to cost $80,000. Preliminary plans have been prepared by W. J. Watson & Co. Leader-News building, Cleveland.

FAIRMONT, W. VA. — The Baltimore & Ohio railroad plans to erect and equip a car wheel shop. F. L. Stuart, Baltimore, is chief engineer.

LOGAN, W. VA.—City contemplates the construction of a water plant.

NEW CUMBERLAND, W. VA. — The National Steel Casting Co. has broken ground for a foundry and machine shop, which will be augmented by a 20-ton crane. A 15-ton acid open hearth furnace, an electric furnace and auxiliary equipment will be installed.

WELLSBURG, W. VA.—The Wellsburg & Eastern railroad will build a line from Wellsburg to Durford, Pa., a distance of ten miles.

WHEELING, W. VA.—The Newport Contracting & Engineering Co., Newport News, Va., has been awarded contracts for power houses for Ohio river dams No. 16 and 17.

WHEELING, W. VA.—The New York Central railroad plans to build a railway from Wheeling to Dillondale, O., a distance of 20 miles. G. W. Kittredge, New York City, is chief engineer.

WILLIAMSON, W. VA.—The Williamson Light & Ice Co. will build a cold storage plant, to cost $50,000; plans are being prepared by M. R. Carpenter, architect, 62 Pickering building, Cincinnati.

COLUMBUS, IND. — Bids will be taken shortly by Elmer M. Dean, city clerk, for a municipal electric light plant.

INDIANAPOLIS, IND. — The Hoosier Truck Co. has been incorporated to manufacture automobile trucks and parts; $5,000 capital; by Charles M. Howell, Reuben W. Estet and Otis Edgington.

INDIANAPOLIS, IND.—The Indianapolis & Cincinnati Traction Co. will build a line from Rushville to Cincinnati.

PITTSBURG, IND.—The commissioners of White and Carroll counties will meet at Delphi, March 24, to open bids on steel bridge 512 feet long over Tippecanoe river between the counties, at a cost of $30,000.

AURORA, ILL.—An election will be held in April on issuing $100,000 in bonds to extend the municipal electric light plant.

BRIDGEPORT, ILL.—The Oil Belt railroad, J. B. Campbell, secretary and general manager, will build a line from Bridgeport to Vincennes, Ind., and the coal fields at Bicknell, Ind.

CHICAGO. — The American Steel Treating Co. has been incorporated; $15,000 capital stock; by Theodore G. Seleck, Frank J. Ahren and Anna Ahren.

CHICAGO.—The Waterloo Boy Kerosene Tractor Co. has been incorporated; $10,000 capital; by Van N. Marker, B. Rudolph and A. D. Landpher, Mazonia, Ill.

CHICAGO.—J. H. Roseberg, 2028 Rice street, will build a 2-story, $30,000 factory, 100 x 150 feet, at 642 North Kedzie avenue, to manufacture metal specialties.

GALESBURG, ILL.—The Galesburg Railway, Light & Power Co. is planning to spend $225,000 for improvements and enlargements at its electric plant.

LOCKPORT, ILL.—Bids will be received until April 4 by John Lambert, president of the penitentiary commission, 863 Rookery building, Chicago, for structural steel and steel window guards and cell fronts for a cell

ROCK ISLAND, ILL.—Bids will be received until April 8 by the county supervisors for a reinforced concrete bridge over Rock river, to cost $60,000.

DETROIT.—The Kalis-Haskel Co., manufacturer of sheet metal stampings and tools, has increased its capital stock from $40,000 to $100,000.

DETROIT.—The Detroit Electrical Branding Iron Co. has been incorporated to manufacture electric devices; $50,000 capital; by William Gutman, Joseph C. Garner and Benjamin B. Pelham.

ANTIGO, WIS.—The Langlade Lumber Co., organized recently at Antigo, with $1,200,000 capital to take over a tract of 55,000 acres of timberland in Langlade county, Wis., has purchased an 80-acre site at the limits of Antigo and will erect a sawmill to produce soft and hardwood lumber, lath, shingles and railroad ties. The mill will be a single-band with horizontal resaw, with a steam power plant. Electric motor-drive will be employed throughout. L. K. Baker, Odanah, Wis., is president.

CUDAHY, WIS. — The Obenberger Drop Forge Co., Packard avenue, is building a 1-story forge shop, 75 x 75 feet.

DELAVAN, WIS.—The Wisconsin railroad commission has authorized the Southern Wisconsin Light, Heat & Power Co., Lake Geneva, Wis., to issue $20,000 in stock and $19,000 in bonds for the purchase of the United Heat, Light & Power Co.'s properties at Delavan.

EAU CLAIRE, WIS.—The Laursen Automatic Pump Co., Eau Claire, manufacturing deep well pumping engines for mining, irrigation and drainage projects, has purchased the plant of the Globe Iron Works, Menomonie, and will take possession as soon as the buildings can be overhauled and additional equipment installed. The Globe works have been idle for three years, since the property was turned over to the bondholders. The Laursen company is headed by L. A. Laursen. Several large pumping engines are being constructed for delivery to Alaska.

FULTON, WIS.—Articles of incorporation have been filed by the Mutual Machinery Co., Fulton, Wis. The capital is $7,500 and the incorporators are James R. Thomson, Albert Stark and George W. Stark.

GREEN BAY, WIS. — The Lucia Bros. Motor Car Co., 218 North Adams street, is having plans prepared for a 2-story addition, 40 x 80 feet, to its garage and repair shop. W. E. Reynolds is the architect in charge.

MADISON, WIS.—M. W. Torkelson, bridge engineer, state highway commission, Madison, is preparing plans for a new highway bridge to be erected over St. Croix river near Danbury, Burnett county. It will have three spans of 70 feet each, with 16-foot roadway, built on steel piers, with concrete approaches and floor. H. Jeffries is county highway commissioner, Gransburg, Wis.

MANITOWOC, WIS.—The Blake Construction Co., Appleton, Wis., has been awarded a general contract for the erection of a reinforced concrete factory addition for the Aluminum Specialty Co., Manitowoc. The plant will be two stories, 40 x 60 feet and located at Sixth and York streets. E. W. Krug is president.

MILWAUKEE. — The Cutler-Hammer Co., Thirteenth and St. Paul avenues, Milwaukee, has been granted a permit to build a steel transformer house to cost about $2,500.

MILWAUKEE. — Articles of incorporation have been filed by the Brown-Schefrin Co., Milwaukee, to deal in scrap metal. The capital stock is $20,000. The incorporators are Samuel Schefrin, R. E. Locher and Leo F. Saltzstein.

MILWAUKEE.—The Erwin Mfg. Co. has been incorporated to engage in the manufacture of fire extinguishing systems and devices. The capital is $25,000 and the incorporators are J. B. Erwin, O. R. Erwin and L. E. Erwin. Offices have been established at 78 Loan & Trust building, Milwaukee.

MILWAUKEE.—John H. Parker Co., New York, general contractor for the $1,250,000 Plankinton Arcade and theater, Grand avenue, West Water and Second streets, has awarded the sheet metal work to the Sykes Co., Chicago. All important contracts have now been let. Holabird & Roche, Chicago, are the architects.

PITTSVILLE, WIS. — Gottlob Lenheer, operating a sawmill near Pittsville, Wis., is planning to undertake a production of power stump-pulling machines, operated by gas tractors. It will be built with 12, 16 and 20-horsepower engines.

PORTAGE, WIS.—The Janesville & Madison Traction Co., J. E. Jones, Portage, Wis., manager, has advised the Wisconsin railroad commission that it has obtained sufficient capital to enable it to construct its road, an electric interurban line from Janesville to Madison and Portage, Wis. The company will ask for a permit to issue securities within a short time and then undertake construction.

WEST ALLIS, WIS.—The city of West Allis is considering construction of a municipal electric light plant.

Up and Down the Pacific Coast

FRESNO, CAL.—The Fresno Interurban railroad will build a 5-mile extension to Clovis and a 12-mile extension to Centerville.

SAN FRANCISCO.—The Martinez & Concord Interurban railroad has been incorporated to build a 7-mile line from Martinez to Concord. Clifford McClellan, San Francisco, is interested in the project.

SANTA ANA, CAL.—The Pacific Electric railroad, J. McMillan, general manager, Los Angeles, is planning to construct a steel bridge consisting of five 90-foot spans over the Santa Ana river.

OKANOGAN, WASH. — During 1916 the county will construct a $10,000 220-foot span steel bridge. Horace S. Smith is county engineer.

PENDLETON, ORE. — The Blewitt Harvester Co. will probably erect a factory building in Pendleton in the near future. The company is incorporated for $100,000.

PRINEVILLE, ORE.—One 80-foot concrete bridge and one 110-foot steel span bridge will be constructed by the county during 1916. G. S. Springer is county judge.

SALEM, ORE. — State highway department has completed plans for a 160-foot steel bridge over Willamette slough, to cost $13,000. A 100-foot steel span will be constructed over Rock Creek, at Veronia.

SALEM, ORE.—The state bridge department, John H. Lewis, state engineer, has approved plans as follows: 300-foot reinforced concrete viaduct at McMinville, costing $14,000; a 106-foot steel span bridge near Wheatland, costing $13,000; a 100-foot steel span at Veronia and a 50-foot girder span near Deer Island.

SILVERTON, ORE.—The Silver Falls Timber Co. will build a sawmill this spring at a cost of about $500,000.

VANCOUVER, B. C. — The Canadian Northern railway has been authorized to open negotiations with the Great Northern railway for the construction of a union depot in Vancouver at a cost of $1,500,000.

New Business in Eastern Canada

LITTLE BRAS d'OR, N. S.—The briquette plant, machine shop, bank head and boiler house of the Colonial Coal Co. was damaged by fire with a loss of $50,000.

WOLFVILLE, N. S.—The Bay of Fundy Tide-Power Co. has been incorporated to carry on business as an electric light, heat and power company; $50,000 capital stock; by George B. Cutten, Ralph P. Clarkson, W. L. Archibald and others of Wolfville.

HAMILTON, ONT. — The Hamilton By-Products Coke Oven Co. will build coke ovens on the water front in the northeastern section of the city, at a cost of $2,000,000.

LONDON, ONT.—The Beemer & Co. have been incorporated to build automobiles, engines and vehicles, and accessories; $35,000 capital; by John C. Beemer, Frank D. McLachlin and Adora Beemer, all of London.

LONDON, ONT.—The Utility Electric Mfg. Co. has been incorporated to manufacture electric ranges, stoves and heaters and all kinds of electrical goods; $40,000 capital; provisional directors, Robert James Gracey and John Lussex, of London and James A. Ross of Wellandport, Ont.

NEW TORONTO, ONT.—The Brown Copper & Brass Rolling Mills Co., will build an addition to its plant to cost $25,000.

PETERBOROUGH, ONT.—The city council is considering the construction of a sewage disposal plant. R. S. Armstrong is clerk to the council.

PETERBOROUGH, ONT.—The Dominion Dustless Sweepers, Ltd., has been incorporated to manufacture street cleaning machinery; $200,000 capital stock; by Wm. H. Hamilton, Wm. M. Lang and others of Peterborough, and John A. Corrick, Detroit, Mich.

PORT SYDNEY, ONT.—S. Smith is in the market for a marine engine, six and 10 or 12 x 9 inches with condenser.

SARNIA, ONT.—The Imperial Oil Co. will build an addition to its machine shop at Sarnia.

SARNIA, ONT.—The Imperial Oil Co., Sarnia, Ont., will purchase machinery, pumps, boilers, steel work, etc., for the company's refinery to be erected at Regina, Sask.

SAULT STE. MARIE, ONT.—The Algoma Steel Corporation is completing arrangements for the manufacture of munitions at its Soo plant. A contract has been awarded to McPhail & Wright Construction Co. for the erection of a building on the site formerly occupied by the company's saw mill. The new plant will be 120 x 350 feet and will cost $50,000.

SUDBURY, ONT.—The Sudbury Construction & Machinery Co. will build an addition to its factory to cost $6,000. Work will be started at once.

SUDBURY, ONT.—The Sudbury Nickel Co. has been incorporated to refine copper and nickel; $100,000 capital stock; by Thomas E. Smith, Wallace N. Smith, George J. Valin and others, all of Toronto.

TORONTO, ONT.—The Martin Corrugated Iron Paper Box Co., will erect a factory at 205 Pape avenue, Toronto, to cost $16,000.

TORONTO, ONT. — The Sheet Metal Products Co. will build an addition to its factory on Oak street at a cost of $11,300.

TORONTO, ONT. — The Automobile & Supply Co. will expend $24,000 in alterations to its show room and garage at 249 Simcoe street.

TORONTO, ONT.—The Sheet Metal Prodcuts Co. of Canada, will commence work on an addition to its plant at 199 River street, to cost $20,000.

TORONTO, ONT.—White & Thomas, 212 Simcoe street, have received a permit for the erection of a 2-story addition to their factory at Toronto. The company manufactures sheet metal products, etc.

TORONTO, ONT. — The Ontario Metal Products Co. has secured a building on Pearl street and will enlarge it and install machinery and equipment for the manufacture of its specialty.

TORONTO, ONT.—The Nuray Sign Co. has been incorporated to carry on business as electrician and manufacturers; $30,000 capital; by James Curry, Arthur W. Hugman and James Parker, all of Toronto.

TORONTO, ONT.—The Aeroplane Products Co. has been incorporated to build aeroplanes; $40,000 capital stock; by Albert Mearns, Edwin G. Long and Joseph E. Belfry, all of Toronto.

TORONTO, ONT.—The Multisize Rotary Press, Ltd., has been incorporated to manufacture machinery; $150,000 capital stock; by George McC. Willoughby, Joseph M. Bullen and Harold L. Steele, all of Toronto.

TORONTO, ONT.—The Fort William Dock Co. has been incorporated to build warehouses and docks and wharves; $500,000 capital stock; by James B. Taylor, William A. Case, William J. Beattie and others, all of Toronto.

TORONTO, ONT.—The Amalgamated Ammunition Machinery Co. has been incorporated to manufacture machinery, tools, munitions, motors, engines, boilers and automobiles, etc.; $100,000 capital stock; by Thomas N. Poole, 67 Brunswick avenue; Henry J. Martin, 6 Adelaide street east, Charles A. Snowdon and others all of Toronto.

TORONTO, ONT.—The Metropolitan Glass Co. has been incorporated to manufacture glass and carry on a general sheet metal business; $40,000 capital stock; by John B. Robinson, George A. Robinson, George D. McCleod and others, all of Toronto.

TORONTO, ONT.—The Wilson Scale & Machinery Corporation has been incorporated to manufacture scales, tools, machinery and hardware; $100,000 capital; by James T. Lauder, Frederick J. Norris and Charles Stanley, all of Toronto.

TORONTO, ONT.—The Toronto Builders Supplies Co. has been incorporated to manufacture builders supplies of all kinds; $150,000 capital; by Gordon McLaughlin, Wm. B. Milliken, Fred Lane and others, all of Toronto.

TORONTO, ONT.—The John V. Gray Construction Co. has been incorporated to carry on the business of general contractor and engineer; $40,000 capital; provisional directors, John V. Gray, John C. McK. MacBeth and Robert Wherry, all of Toronto.

TORONTO, ONT. — The Canadian Cartridge Co. has been incorporated to manufacture cartridges, iron, steel, machinery, ammunition, etc.; $750,000 capital stock; by Arthur J. Thomson, 132 Balmoral avenue, William S. Morlock, 107 Roxborough street west R. H. Parmenter and others all of Toronto.

WALKERVILLE, ONT. — The Waterland Motor Co. has been incorporated to build motors, engines, machinery and tools; $300,000 capital stock; by William R. Woollatt, George Reid and others of Walkerville, and Oliver A. Light, Indianapolis, Ind.

WALKERVILLE, ONT.—Canadian Brush Machinery Co. has been incorporated to carry on business as mechanical engineer, machinist and builder of machinery and tools; $50,000 capital stock; by Wm. G. Leibug and Wm. M. Swan of Detroit, William Elsey, Windsor, and others.

WINDSOR, ONT.—A. R. Bartlet, Windsor, is preparing plans for a factory to be erected for the Chalmers Motor Co., of Detroit, Mich.

HULL, QUE.—The Quebec Provincial board of health has ordered the city to install a mechanical filtration system for its water supply. The cost will be about $200,000.

WEEDON, QUE.—The plant of the Weedon Chemical Co., which was recently damaged by fire with a loss of $60,000 is being rebuilt and will shortly be ready for operation. The company is negotiating for a site for the erection of another chemical plant to manufacture crude wood alcohol, acetate of lime and charcoal.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Lower price to July 1; higher to Jan. 1.)

Bessemer, valley	$20.50 to 21.00
Bessemer, Pittsburgh	21.45
Basic, Pittsburgh	18.95 to 19.45
Basic, eastern Pa.	19.75 to 20.25
Basic, Buffalo	20.00
Malleable, Pittsburgh	19.45 to 19.95
Malleable foundry, Chicago	19.00
Malleable foundry, Philadelphia	20.50 to 20.75
Malleable foundry, Buffalo	18.00 to 19.00
No. 1X foundry, Philadelphia	20.50 to 20.75
No. 2 foundry, Pittsburgh	19.45 to 19.95
No. 2 foundry, Cleveland	19.00
No. 2 foundry, Ironton	18.00 to 19.00
No. 2 foundry, Chicago	18.50
No. 2X foundry, Philadelphia	20.00 to 20.50
No. 2X foundry, N. J. tidewater	20.00 to 20.50
No. 2X foundry, Buffalo	18.00 to 19.00
No. 2 plain, Philadelphia	19.50 to 20.00
No. 2 plain, N. J. tidewater	19.50 to 20.00
No. 2 plain, Buffalo	17.50 to 18.50
No. 2 southern, Birmingham	15.00 to 15.50
No. 2 southern, Cincinnati	17.40 to 17.90
No. 2 southern, Chicago	19.00 to 19.50
No. 2 southern, Phila. delivery	20.00 to 20.50
No. 2 southern, Cleveland	19.00 to 19.50
No. 2 southern, New York docks	19.00 to 19.50
No. 2 southern, Boston docks	19.25 to 19.75
No. 2 south. interior, New Eng.	20.00 to 21.00
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X furnace	18.00
Virginia 2X, Philadelphia	20.75
Virginia 2X, Jersey City	21.00
Virginia 2X, Boston points	21.25
Gray forge, eastern Pa.	18.50 to 19.00
Gray forge, Pittsburgh	18.45 to 18.95
Gray forge, Birmingham	14.00 to 15.00
Silveries, 8 per cent, furnace	26.00 to 27.00
Silveries, 8 per cent, Chicago	29.50
Low phos. Standard, Phila.	32.00
Low phos. Lebanon, Pa.	29.00 to 31.00
Low phos. Pittsburgh	30.00 to 31.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	19.75 to 22.25
Charcoal, Buffalo	19.00 to 20.00
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.

(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	$4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bes., 51½ per cent, ton	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.

(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit.	8.6c to 8.9c
Local N. Y. and N. J. ores, unit.	8.5c to 8.75c
Port Henry lump, at mines, ton	$4.00

Foreign Ores.

(Per unit Philadelphia.)

(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½
For'n non-Bess., 50 to 65 per cent	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$3.75
Connellsville fur., contract	2.50 to 3.00
Connellsville foundry	3.75 to 4.00
Connellsville fdy. contract	3.75 to 4.00
Wise county furnace, contract	2.85 to 3.25
Wise county foundry, contract	3.50 to 3.75
Pocahontas foundry, contract	3.25 to 3.75
Pocahontas furnace, contract	2.85 to 3.25
New River, foundry contract	3.75 to 4.25
New River, furnace contract	3.25 to 3.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., delivered (prompt)	$225 to 250
Ferro mang., Balti., (future)	175
Spiegelensen 20 per cent, furnace	50.00
Ferro-silicon, 50 per cent, Phila.	83.00 to 85.00
Ferro silicon, 50 per cent, Pbgh.	83.00 to 85.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $30.00; 10 to 11 per cent, $31.00; 11 to 12 per cent, $32.00; 12 to 13 per cent, $33.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 25 cents per pound; 2 per cent carbon, nominal.

Ferro-vanadium, nominal, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, nominal.

Ferro-tungsten, nominal.

Cobalt metal, nominal, Pittsburgh.

Aluminum, nominal, Pittsburgh.

Ferry-molybdenum, Pittsburgh, nominal.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive for insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$45.00 to 50.00
Forging billets, Phila.	55.00 to 65.00
Forging billets, Pbgh., nominal.	55.00 to 65.00
Forging billets, Chgo.	55.00 to 60.00
Wire rods, Pittsburgh (nom.)	50.00 to 60.00
Bessemer billets, Youngstown	38.00 to 40.00
Bessemer billets, Pittsburgh	38.00 to 40.00
Open hearth billets, Pittsburgh.	38.00 to 40.00
Open hearth billets, Youngstown	38.00 to 40.00
Bess. sheet bars, Youngstown	38.00 to 40.00
Op. h'th sheet bars, Youngstown	38.00 to 40.00
Bess. sheet bars, Pittsburgh	40.00 to 42.00
Open h'th sh. bars, Pbgh.	40.00 to 42.00
Muck bar, Pittsburgh (nominal)	40.00

SKELP

Grooved steel skelp	2.25c
Sheared steel skelp	2.35c

RAILS AND TRACK MATERIAL

Stand. Bess. rails, Pbgh. & Chg.	1.25c
Stan. op-h'th rails, Pbgh. & Chg.	1.34c
Light rails, 8 to 10 lbs., Pbgh.	1.85c
Light rails, 8 lb., Chgo.	1.76c
Light rails, 12 to 14 lbs., Pbgh.	1.80c
Light rails, 12 lbs., Chgo.	1.71c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Broklyn (by canal)	1.25 to 1.60

Virginia furnaces to:—

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Ala., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75

Chicago to:—

Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails 16 to 20 lbs., Pbgh.	1.75c
Light rails 16 to 20 lbs., Chgo.	1.66c
Light rails 25 to 45 lbs., Pbgh.	1.70c
Light rails 25 to 45 lbs., Chgo.	1.61c
Relaying rails, standard, Pbgh. and Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect., Pbgh., base	1.50c to 1.75c
Angel bars, st. sections, Chgo.	1.50c to 1.75c
Spikes, railroad, Pbgh.	2.50c to 2.65c
Spikes, railroad, Chgo.	2.60c to 2.75c
Track bolts, Pbgh.	3.25c
Track bolts, Chgo.	3.25c to 3.50c
Tie plates, Chgo.	45.00 to 48.00

SHAPES, PLATES AND BARS

Structural shapes, Pbgh.	2.50c
Structural shapes, Pbgh. (con.)	2.25c to 2.50c
Structural shapes, Chgo.	2.44c to 2.69c
Structural shapes, Philadelphia	2.409c to 2.659c
Structural shapes, New York	2.419c to 2.669c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chgo.	2.54c to 3.19c
Tank plates, Pbgh. (con.)	2.35c to 2.60c
Tank plates, Pbgh.	2.75c to 3.25c
Tank plates, Philadelphia	2.509c to 3.409c
Tank plates, New York	2.519c to 3.419c
Bars, soft, steel, Pbgh. (con.)	2.25c to 2.50c
Bars, soft steel, Chgo.	2.44c to 2.69c
Bars, soft steel, Pbgh. (con.)	2.00c to 2.25c
Bars, soft steel, Pbgh.	2.50c
Bars, soft steel, New York	2.419c
Hoops, carloads, Pbgh.	2.50c
Bands, Pittsburgh	2.25c
Shafting, Pbgh., contr. carloads	30 off
Bar iron, Chgo.	2.10c to 2.25c
Bar iron, Philadelphia	2.559c
Bar iron, New York	2.569c
Bar iron, Cleveland	2.25c
Bar iron, Pittsburgh	2.40c to 2.50c
Hard steel bars, Chgo.	2.25c to 2.35c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	2.75c to 2.85c
No. 28, black, Chgo.	2.94c to 3.19c
No. 28, tin mill, black, Pbgh.	2.70c to 2.80c
No. 28, galvanized, Pbgh.	4.75c to 5.25c
No. 28, galvanized, Chgo.	5.19c
No. 10, blue anl'd, Pbgh.	2.90c to 3.00c
No. 10, blue anl'd, Phila.	2.809c to 3.409c
No. 10, blue anl'd, Chgo.	2.94c to 3.19c
Tin plate, 100 lb., coke base	$4.00 to 4.25

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickl'd, cold roll. and re-anld.	30 cents
Hot roll'd pickled and anl., tin mill.	25 cents
Full pickled, cold rolled and re-anld.	50 cents
Auto sheets	75 cents
Blue stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel, free from mill scale	80 cents
Extra deep special auto body stock.	1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld.	Galv. Butt-weld.
Steel ¾ to 3 inches	74	57½
Iron, ¾ to 1½ inches	61	41
	Lap-weld.	
Steel, 2½ to 6 inches	73	56½

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	62
Iron, 3½ to 4½ inches, l. c. l.	51

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.40
Plain wire, jobbers', Pittsburgh	2.25
Galvanized wire, jobbers', Pbgh.	2.95
Polished staples, Pbgh.	2.55
Galvanized staples, Pbgh.	3.25
Barb wire, painted, jobbers', Pbgh.	2.55
Barb wire, galv., jobbers', Pbgh.	3.25

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 65 and 5, cut threads 65; larger or longer, 50 and 15.

Machine bolts with hot pressed nuts, ⅜ x 4 inches, smaller or shorter, rolled 65 and 10; cut, 65 and 5; larger or longer, 50 and 20.

Cold pressed, semi-finished hexagon nuts, 75 and 10.

Gimlet and cone point lag bolts, 65, 10 and 5. Hot pressed square, blank or tapped nuts, $3.70 off list; hot pressed hexagon blank or tapped, $3.89.

Cold pressed square, blank or tapped, $3.50 off; hexagon, blank or tapped, all sizes, $4.25.

RIVETS

Structural rivets, Pbgh	3.00c
Structural rivets, Chgo. delivery	3.10c
Boiler rivets, Pbgh	2.91c
Boiler rivets, Chgo. delivery	3.00c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.25c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	4.50c

COLD ROLLED STRIP STEEL

Base price $5.00 to $5.50 per 100 pounds, hard, coils 1½ inches and wider and by .100 inches and heavier.

Extras.

.10 to .19 carbon. 1½ inches and wider.

Coils.

	Hard.	Soft.
0.100 and heavier	Base	$0.25
0.050 to 0.099	$0.05	0.30
0.035 to 0.049	0.20	0.45
0.031 to 0.034	0.35	0.75
0.025 to 0.030	0.45	0.85
0.020 to 0.024	0.55	0.95
0.017 to 0.019	1.35	1.35
0.015 to 0.016	1.75	1.75
0.013 to 0.014	2.45	2.45
0.012	2.80	2.80
0.011	3.15	3.15
0.010	3.50	3.50

Lengths 24 Inches and Over.

	Hard.	Soft.
0.100 and heavier	$0.10	$0.35
0.050 to 0.099	0.20	0.45
0.035 to 0.049	0.35	0.60
0.031 to 0.034	0.60	1.00
0.025 to 0.030	0.85	1.25
0.020 to 0.024	1.05	1.45
0.017 to 0.019	2.45	2.45
0.015 to 0.016	2.85	2.85
0.013 to 0.014	3.70	3.70
0.012	4.30	4.30
0.011	4.65	4.65
0.010	5.00	5.00

Extras as per card of Jan. 1, 1916.

CAST IRON WATER PIPE

Four-inch, Chicago	$32.50 to 33.00
Six-inch and larger, Chicago	29.50 to 30.00
Six-inch Class B, New York	29.50
Four-inch, Class B, New York	32.50
Four to six-inch, Birmingham	28.00
Six-inch and larger, Birmingham	25.00

Light weight water and gas pipe, $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	2.90c
Steel squares, 2-in. & ov., Cleve.	3.50c
Steel rounds, 2-in. & ov., Cleve.	3.20c
Steel bars, under 2 in., Cleveland	3.00c
Steel bars, Philadelphia	2.85c
Steel bars, New York	2.95c
Steel bars, St. Louis	2.95c
Steel bars, Cincinnati	3.00c to 3.50c
Steel bars, St. Paul	3.00c
Steel bars, over 2-inch, Buffalo	3.65c
Steel bars, Buffalo	2.95c
Iron bars, Chicago	2.30c
Iron bars, Cleveland	2.95c
Iron bars, St. Louis	2.75c
Iron bars, Cincinnati	3.00c to 3.50c
Iron bars, Philadelphia	2.85c to 3.00c
Iron bars, New York	2.95c
Shapes, Chgo.	2.90c
Shapes, St. Louis	2.95c
Shapes, St. Paul	3.00c
Shapes, New York	2.95c
Shapes, Cleveland	3.00c
Shapes, Philadelphia	2.85c
Shapes, Buffalo	2.95c
Shapes and plates, Cincinnati	3.00c to 3.15c
Plates, Chgo.	3.15c
Plates, St. Louis	3.20c
Plates, St. Paul	3.25c
Plates, New York	3.50c
Plates, Cleveland	3.15c
Plates, Philadelphia	3.50c
No. 10 blue anl. sheets, Chgo.	3.10c
No. 10 blue anl. sheets, Clevel'd	3.25c
No. 10 blue anl. sheets, Buffalo	3.25c
No. 10 blue anl. sh'ts, St. Louis	3.00c
No. 10 blue anl. sheets, Cinci.	3.25c to 3.50c
No. 10 blue anl. sheets, St. Paul	3.05c
No. 28 black sheets, Chgo.	3.10c
No. 28 black sheets, Cleveland	2.95c
No. 28 black sheets, Cincinnati	3.65c
No. 28 black sheets, St. Louis	3.20c
No. 28 black sheets, St. Paul	3.25c
No. 28 galv. sheets, Chgo.	4.80c to 5.00c
No. 28 galv. sheets, Cleveland	5.25c
No. 28 galv. sheets, Cincinnati	5.30c
No. 28 galvanized sheets, St. L.	5.25c to 5.50c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Arch bars and transoms, Chgo.	$18.00 to 18.50
Angle bars, iron, Chicago	17.25 to 17.75
Angle bars, steel, St. Louis	14.00 to 14.50
Arch bars and transoms, Chgo.	19.00 to 19.50
Arch bars and transoms, St. L.	18.50 to 19.00
Cut forge, Chicago	15.00 to 15.25
Knuckles, coup., Chgo	16.00 to 16.25
Springs, St. Louis	15.50 to 16.00
Springs, Chgo.	16.25 to 16.50
Knuckles, coup., St. L.	15.50 to 16.00
Locomotive tires, Chicago	17.00 to 17.50
Locomotive tires, St. Louis	17.00 to 17.50
Railroad wrought, No. 1, Chgo.	16.25 to 16.75
Railroad wrought, No. 1, Cleve.	18.00 to 18.50
Railroad wrought, No. 1, St. L.	15.50 to 16.00
Railroad wrought, No. 1, Cinci.	12.50 to 13.00
Railroad wrought, No. 2, Chgo.	15.00 to 15.25
Railroad wrought, No. 2, St. L.	15.00 to 15.50
Shafting, St. Louis	18.00 to 18.50
Steel car axles, Birmingham	14.50
Steel car axles, St. Louis	21.00 to 22.00
Steel car axles, Chicago	22.25 to 22.75

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Boiler plate, cut, No. 1, Chgo.	11.50 to 12.00
Boiler plate, cut, No. 1, St. L.	9.50 to 10.00
Boiler punchings, Chicago	14.00 to 14.50
Busheling, No. 1, Chicago	12.50 to 13.00
Busheling, No. 1, Cleveland	14.00 to 14.50
Busheling, No. 1, Cincinnati	10.25 to 10.75
Busheling, No. 1, St. Louis	11.50 to 12.00
Busheling, No. 2, Chicago	8.75 to 9.25
Bundled sheet, Cincinnati	8.50 to 9.00
Cast, No. 1, Cleveland	13.75 to 14.25
Cast, No. 1, Cincinnati	11.50 to 12.00
Cast, No. 1, St. Louis	13.00 to 13.50
Cast No. 1, Chicago	13.00 to 13.50
Cast borings, Chicago	7.25 to 7.75
Cast borings, Cleveland	8.50 to 8.75
Cast borings, Cincinnati	7.50 to 8.00
Cast borings, St. Louis	7.00 to 7.50
Machine shop turnings, Chgo.	8.00 to 8.50
Machine shop turnings, Clevel'd.	7.25 to 7.50
Machine shop turnings, Cinci.	7.00 to 7.50
Machine shop turnings, St. L.	7.50 to 8.00
Malleable agricultural, Chgo.	12.00 to 12.50
Malleable agricultural, St. Louis.	12.50 to 13.00
Malleable railroad, Chicago	13.50 to 14.00
Malleable, Cincinnati	8.50 to 9.00
Malleable railroad, St. Louis	12.50 to 13.00
Pipes and flues, Cleve'd (nom.)	13.00 to 13.75
Pipes and flues, Chicago	11.00 to 11.50
Pipes and flues, St. Louis	10.50 to 11.00
Stove plate, Chicago	11.00 to 11.50
Stove plate, Cleveland	10.25 to 10.75
Stove plate, Buffalo	11.00 to 11.50
Stove plate, Cincinnati	8.00 to 8.50
Stove plate, St. Louis	10.00 to 10.50

(Gross tons.)

Boiler plate sheared, Buffalo	13.00 to 13.50
Busheling, No. 1, Buffalo	13.50 to 14.00
Busheling, No. 1, Pbgh.	14.50 to 15.00
Busheling, No. 2, Buffalo	11.00 to 11.50
Bundled sheet, Pittsburgh	14.50 to 15.00
Bundled sheet, Cleveland	12.75 to 13.25
Bundeld sheet, Buffalo	12.00 to 12.50
Car wheels (iron), Pittsburgh	15.00 to 15.50
Car wheels (steel), Pittsburgh	18.00 to 18.50
Car wheels, Chicago	14.00 to 14.25
Car wheels, eastern Pa.	16.00 to 16.50
Car wheels, Buffalo	15.25 to 15.75
Car wheels, N. Y.	14.00 to 14.50
Car wheels, St. Louis	13.50 to 14.00
Cast borings, New York	9.00 to 9.25
Cast borings, eastern Pa.	11.00 to 11.50
Cast borings, Buffalo	9.25 to 9.75
Cast borings, Pittsburgh	11.25 to 11.50
Cast, No. 1, eastern Pa.	17.50 to 18.00
Cast, No. 1, Pittsburgh	15.50 to 16.00
Cast, heavy No. 1, N. J. points	16.50 to 17.00
Forge No. 1, eastern Pa.	14.00 to 14.50
Frogs, switches, guards, Chgo.	16.25 to 16.75
Frogs, switches, guards, St. L.	15.75 to 16.25
Grate bars, Buffalo	11.00 to 11.50
Grate bars, N. J. points	13.25 to 13.50
Heavy axle turnings, Buffalo	12.00 to 12.50
Heavy melting steel, Pbgh.	17.50 to 18.00
Heavy melting steel, Buffalo	16.50 to 17.00
Heavy melting steel, Chicago	16.25 to 16.50
Heavy melting steel, Cleveland	16.25 to 16.75
Heavy melting steel, Cincinnati	13.75 to 14.25
Heavy melting steel, eastern Pa.	16.50 to 17.00
Heavy melting steel, New York	14.25 to 14.50
Heavy melting steel, St. Louis	16.00 to 16.50
Iron rails, Chicago	18.00 to 18.50
Iron rails, Buffalo	17.00 to 17.50
Iron rails, Cincinnati	14.00 to 14.50
Iron rails, St. Louis	17.00 to 17.50
Iron rails, Cleveland (nom.)	17.00 to 18.00
Iron axles, Pittsburgh	25.00 to 26.00
Iron axles, Cincinnati	20.25 to 20.75
Iron axles, eastern Pa.	26.00 to 27.00
Iron axles, Chgo.	23.50 to 24.00
Iron axles, St. Louis	20.00 to 21.00
Iron axles, Buffalo	23.00 to 23.50
Low phos. steel, Buffalo	20.50 to 21.00
Low phosphorus steel, Pbgh.	21.50
Low phos. steel, eastern Pa.	22.00 to 23.00
Machine shop turnings, Buffalo.	7.75 to 8.25
Mch. shop turnings, New York.	8.00 to 8.50
Mch. shop turnings, Pbgh.	9.25 to 9.75
Mch. shop turnings, eastern Pa.	9.75 to 10.25
Mall. railroad, Cleveland	16.25 to 16.50
Malleable railroad, Pittsburgh	16.25 to 16.50
Malleable railroad, Buffalo	15.25 to 15.75
Malleable railroad, eastern Pa.	14.50 to 15.00
R. R. and mch. cast, No. 1 Bfl.	15.50 to 16.00
R. R. wrought, No. 1, Buffalo	17.50 to 18.00
Railroad wrought, No. 1, E. Pa.	21.00 to 22.00
R. R. wrgt., No. 1, New York	20.00 to 20.50
Railroad wrought, No. 1, Pbgh.	19.00 to 19.50
Reroll. rails, 5 ft. & ov., Pbgh.	18.00 to 18.50
Reroll. rails, 5 ft. & ov., Chgo.	17.25 to 17.75
Reroll. rails, 5 ft. & ov., Cleve.	16.25 to 16.75
Reroll. rails, 5 ft. & ov., E. Pa.	19.00 to 20.00
Reroll. rails, 5 ft. & ov., St. L.	17.50 to 18.00
Shafting, New York	19.00 to 19.50
Shafting, eastern Pa.	22.00 to 23.00
Shoveling steel, Chicago	15.75 to 16.00
Shoveling steel, St. Louis	14.00 to 14.50
Steel rails, short, Chicago	17.00 to 17.50
Steel rails, short, Cleveland	18.25 to 18.50
Steel rails, short, St. Louis	16.00 to 16.50
Steel car axles, New York	22.00 to 23.00
Steel car axles, Buffalo	23.00 to 23.50
Steel car axles, Cleveland	24.00 to 24.50
Steel car axles, Pittsburgh	25.00 to 28.00
Steel car axles, eastern Pa.	24.00 to 25.00
Stove plate, N. J. points	13.25 to 13.50
Stove plate, Pittsburgh	11.50 to 12.00
Stove plate, eastern Pa.	13.50 to 14.00
Wrought pipe, New York	13.25 to 13.50
Wrought pipe, eastern Pa.	15.25 to 15.75
Wrought pipe, eastern Pa.	14.75 to 15.25

Opportunities

POSITIONS OFFERED

Minimum ad. set solid, 50 words $1.00
Minimum ad. all caps, 50 words $1.50

POSITIONS WANTED

Minimum ad. set sold, 25 words $.50
Minimum ad. all caps, 25 words $.75

(Each additional word set solid, 2c.—Each additional word all caps, 3c.)

Positions Offered

WANTED AT ONCE, SEVERAL FIRST class draftsmen of general mill and blast furnace experience. State age, experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 749, THE IRON TRADE REVIEW, Cleveland, O.

WANTED AT ONCE, SEVERAL DRAFTSMEN experienced in power plant and general piping work. State experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 750, THE IRON TRADE REVIEW, Cleveland, O.

UNDERSIGNED COUNSEL WILL CONFIDENTIALLY negotiate preliminaries for important executive, technical, administrative and professional positions, insuring strictest privacy. Not an agency, but a highly-endorsed, high grade method of negotiating preliminaries only, for $2,000 to $12,000 men. Send address only for explanation. R. W. Bixby, F1 Niagara Square, Buffalo, N. Y.

WANTED: TO CORRESPOND WITH A thoroughly experienced man in drafting and designing gasoline traction engines. Position open for right kind of a man with a good firm in Western Canada. Address Box 806, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — COMPETENT AND EXperienced Superintendent (Gentile) for Iron Yard in St. Louis, Mo. State experience, references and salary desired. Address Box 796 THE IRON TRADE REVIEW, Chicago, Ill.

THE BEST WAY TO GET A GOOD position in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

WANTED:—GENERAL FOREMAN FOR Machine Shop employing about 250 men. Must have experience in heavy and light work of miscellaneous character, must also be able to estimate accurately labor on work. Should be a good organizer and able to produce results. Shop located in Northern Ohio. State age, salary and experience; also references and where last employed. Address Box 797, THE IRON TRADE REVIEW, Cleveland, O.

SHOP SUPERINTENDENT

WANTED BY ORDNANCE PLANT. Must be conversant with modern methods and equipment; also capable of operating under forced draft. Give full particulars as to experience, previous employment, age and salary expected. Applications will be treated in confidence. Address Manager, Box 176, Newark, N. J.

WANTED: — A-1 STEEL FOUNDRY Foreman, thoroughly experienced in alloy steel castings, mixing by analysis; able to layout and equip new plant; must have executive ability to handle men without friction and produce castings of high quality at medium cost. Address Box 812, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—NIGHT SUPERINTENDENT for steel foundry making small high-grade steel castings in middle west. Must be a hustler and well recommended. Give age, experience and wages expected. Address Box 811, THE IRON TRADE REVIEW, Cleveland, O.

Positions Offered

WANTED:—BY A LARGE MALLEABLE iron foundry in the East an experienced Metallurgist, one who can efficiently superintend Laboratory and do research work. State age, experience and salary expected. Address Box 815, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — STEEL FOUNDRY FOREman, one with electric furnace experience preferred. State qualifications, experience and salary in first letter. Address Box 816, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

BLAST FURNACE SUPERINTENDENT, competent, successful and up-to-date in furnace practice. For 10 years making Bessemer iron. Now employed at a record breaking plant making basic iron. Wishes position with a company appreciating good work. Can refer you to past and present employer. Address Box 755, THE IRON TRADE REVIEW, Cleveland, O.

TECHNICAL GRADUATE, SIX YEARS experience in the manufacture of steel castings, including railroad, miscellaneous and manganese track work; would like position as SUPERINTENDENT, MANAGER or SALES ENGINEER. Practical experience in every department of foundry practice and office management. Conversant with best methods and principles of Efficiency. Age 34; possessing pleasing personality with plenty of initiative and executive ability; abundance of physical and mental energy. Best of references. Address Box 805, THE IRON TRADE REVIEW, Cleveland, O.

POSITION AS CHEMIST IN CLEVEland or Pittsburgh district; 7 years experience in open hearth blast furnace and crucible steel laboratories. Best of references. Address Box 801, THE IRON TRADE REVIEW, Cleveland, O.

STRUCTURAL STEEL, ORNAMENTAL iron and reinforced concrete engineer and estimator desires engagement with a company requiring the services of an A-1 man. Address Box 795, THE IRON TRADE REVIEW, Cleveland, O.

For Employer

A co-operative exchange where Employers and Employes meet to mutual advantage.

The first place Employers look for competent help.

The first place capable men offer their services.

And Employe

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Positions Wanted

ORNAMENTAL IRON AND STRUCTUral steel man; desires connection with iron or steel works, graduate civil and mechanical engineer. Can take financial interest and devote all my time to the business. Experienced in selling and contracting for building products, bridges and reinforcing steel, competent designer and estimator. Address Box 742, THE IRON TRADE REVIEW, Cleveland, O.

FOREMAN NOW EMPLOYED, WISHES to make change; have 20 years' experience as pattern maker and foreman, draftsman and designer; last four years in charge of designing, experimental and pattern departments with a large brass firm. Thoroughly up to date on modern shop practice. Address Box 707, THE IRON TRADE REVIEW, Cleveland, O.

WHEN YOU NEED A HIGH GRADE executive, engineer, draftsman, or any technical man, consult The Engineering Agency, Inc., (Est. 24 years), 1662 Monadnock Block, Chicago.

AS BLAST FURNACE SUPERINTENDent or assistant; 16 years experience in making special irons. Am an expert on Ferro Manganese, Spiegel and Silico Spiegel. Address Box 814, THE IRON TRADE REVIEW, Cleveland, O.

CONVERTERMAN

with best abilities and experiences; high grade steels; very competent on automobile and small castings (metal and mold). Can show quick results in any converter shop. A-1 references, reasonable salary. Address Box 813, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT OR GENERAL Foreman; at present employed desires change; good executive and mechanic. Address Box 808, THE IRON TRADE REVIEW, Cleveland, O.

SKELP ROLLER OF LONG EXPErience and well recommended is open for engagement on grooved rolls. Have good inventive ability and of good habits. Address Box 598, THE IRON TRADE REVIEW, Cleveland, O.

AS FOUNDRY SUPERINTENDENT OR manager; graduate in metallurgy and mix by analysis; have wide experience on loams dry and green sand in brass, bronze, steel and iron; expert on molding machines and metal plates, estimating; wood and metal pattern-making; spent 5 years as chief foundry engineer and adviser in U. S. navy yard; age 37, married; can furnish highest references. Address Box 767, THE IRON TRADE REVIEW, Cleveland, O.

WANTED — TO HEAR FROM FIRM desiring service of labor foreman, steel blower, turn foreman, converting open hearth blowing mills. Address Box 780, THE IRON TRADE REVIEW, Cleveland, O.

DRAFTSMAN 31, WITH GOOD EXPErience in design of Rolling Mills and open hearth furnaces, desires position. Machine shop experience and technical training. Address Box 782, THE IRON TRADE REVIEW, Cleveland, O.

POSITION AS CHEMIST IN STEEL mill or foundry by young man of several years experience. Will send particulars and references on request. Address Box 800, THE IRON TRADE REVIEW, Cleveland, O.